telecommunication journal

MONTHLY MAGAZINE OF THE INTERNATIONAL TELECOMMUNICATION UNION – FEBRUARY 1988

ISSN 0497-137X

Full ISDN in action at TELECOM 87

Visitors to the NEC stands at TELECOM 87 saw a total demonstration of ISDN technology in action. The interactive displays of both broadband and narrowband systems included diverse ISDN terminals, computers, business and public ISDN switches, and gigabit-class fiber optic transmission equipment. The demonstration showed how NEC's state-of-the-art computer and communication (C&C) systems are inaugurating the ISDN era in public, business and personal communications.

Broadband ISDN demonstration

To demonstrate the power of a 140Mbps broadband ISDN, NEC linked video communication terminals to a NEAX61 digital switch via optical fibers. The IST-2000* desktop terminals function as a TV telephone, data terminal and personal computer. Users can process data or access a data base while talking over the full-motion video phone or accessing a video information response center.

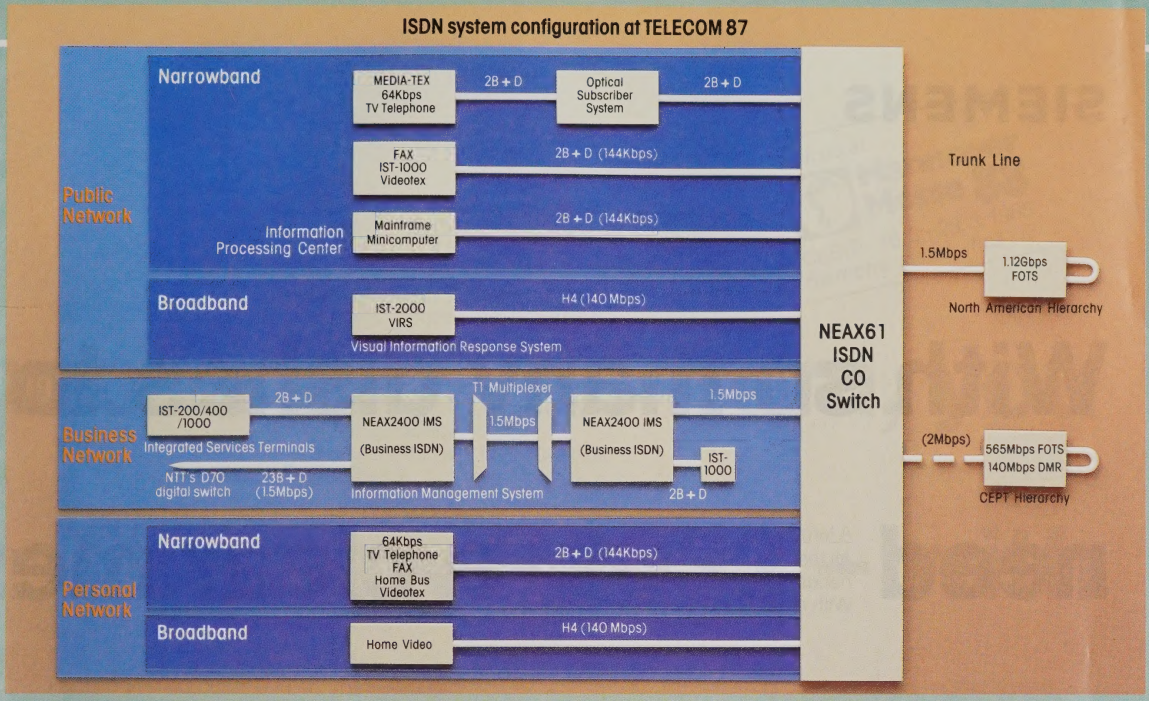
*The specifications of the prototype on display at TELECOM 87 are subject to modification before final product release.

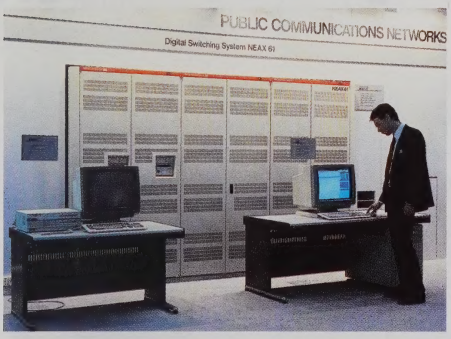
64Kbps color TV telephone

This handy TV phone keeps line costs low by simultaneously transmitting voice and motion video over a single B channel (64Kbps). It is equipped with a 4.3-inch LCD and an ultra-small CCD camera.

C&C advanced videotex

NEC's new high-speed videotex terminal provides enhanced services, still photos with lifelike quality and voice capability – all on a single B channel (64Kbps).





Digital switching system: NEAX61

The core of the demonstration was the NEAX61. It displayed integrated broad- and narrowband switching capability, as well as 1.5Mbps high-speed packet switching.

Network management system (NMS)

The NMS efficiently monitors/controls switching and transmission networks. For easy trouble-shooting, it offers expert system technology which guides users to the source of system problems.

1.12Gbps FOTS

The 1.12Gbps Fiber Optic Transmission System (FOTS) demonstrated its ability to combine 16,128 voice channels into a single-mode fiber.

AT THE R&D ZONE

NEC's intensive R&D efforts, ranging from components to total systems, gave visitors a glimpse of many futuristic visions come true.

4Gbps FOTS

This ultra high-speed system utilizes 1.55μm DFB LDs and InGaAs APDs and transmits over 30km without repeaters.

Photonic switching

NEC's display included a photonic switching system with 8×8 matrix optical switches. The system demonstrated 140Mbps broadband switching capability using IST-2000 video communication terminals.

High resolution CCD color camera

A compact HDTV camera, featuring 1.24-million pixel CCD chips, showed the latest advance in CCD technology.

NEC

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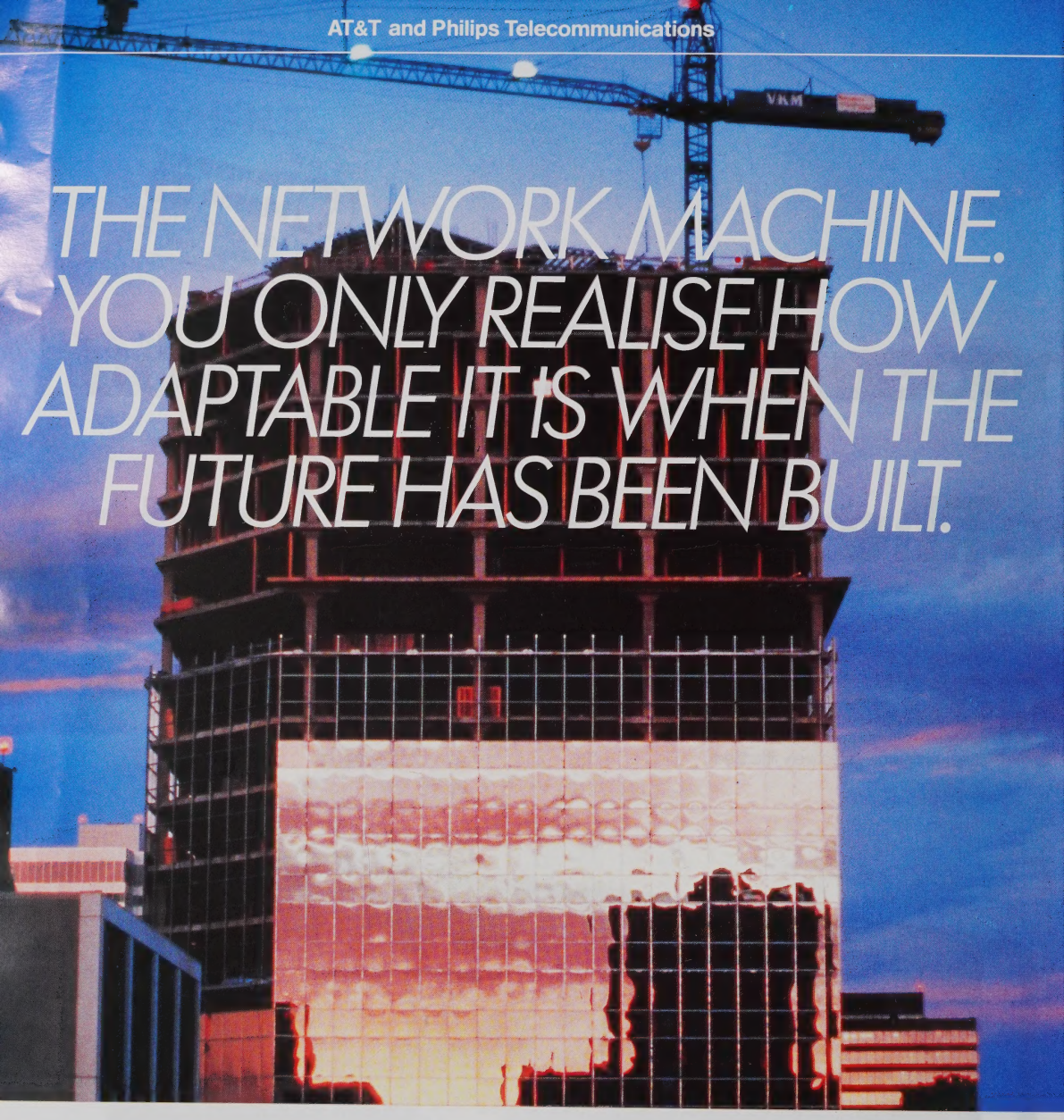

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APT is meeting the challenge of the future with the 5ESS-PRX digital switching system. Because it also lays the basis for the intelligent networks of the next decades we call it the Network Machine.

Think of it as an extremely versatile core, to which modules can be added as required. Currently it is the most advanced public switching system available, with over 14 million installed lines proving its reliability. Though its greatest advantage is its open-ended approach to a future which has not yet taken a clear shape. APT's Network Machine is suitable for any network topology, local or tandem, transit, national or international. It's the most flexible system currently available, easily expanded to provide services like ISDN, Centrex and Freephone within the same network.

Its architecture provides the most flexible and cost-efficient approach to a variety of customer-determined configurations. What's more, it provides an excellent return on investment in both business and private applications.

Because the Network Machine can be expanded and reconfigured gracefully to meet unspecified, even unanticipated future needs, you will only realise how useful it really is when the future has arrived.

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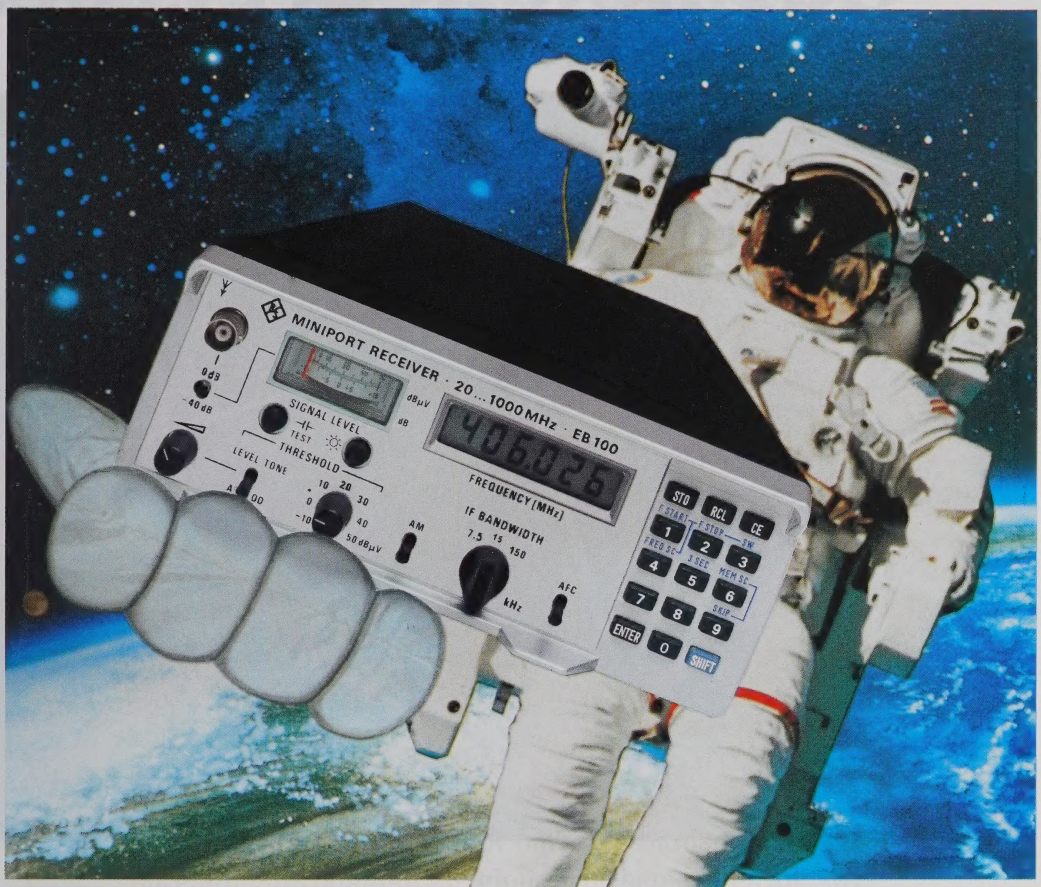

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4 EB E 026

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ROHDE & SCHWARZ
Radiomonitoring and Radiolocation Division

Our new heart is bea

Which country has the highest telephone density in the world?

Which country has the highest computer-terminal density in Europe?

Which country has the lowest (or sometimes second lowest) telephone charges in the world?

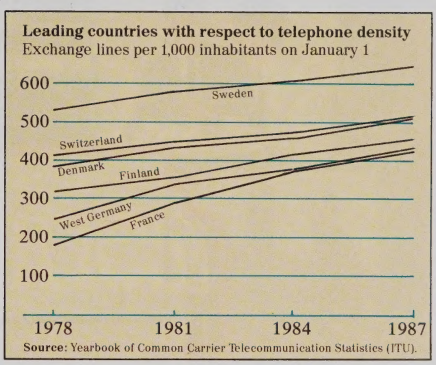
Answers: Sweden, Sweden and, once again, Sweden.

ng fast–64 kbits/sec.

Staying ahead

In November 1987, Swedish Telecom (Televerket) commissioned the first nationwide digital telecommunication network (transmitting data at 64 kbits/sec) in the industrialised world.

Sweden is speeding into the future. Improved, faster and more reliable telecommunications augur a better and more open world.



Sweden has more telephones per capita than any other country, with over 600 exchange lines per 1,000 inhabitants.

Where the action is

Though Swedish at heart, we pay increasing attention to the international market. Modern telecommunications products and systems from our own industry (Teli) are spreading throughout the globe. The same goes for Swedish telecommunications know-how, through our consultant company (Swedtel), and custom-made intercity networks worldwide, through our new company Scandinavian Telecommunication Services.

In modern telecommunications, Scandinavia is where the action is.

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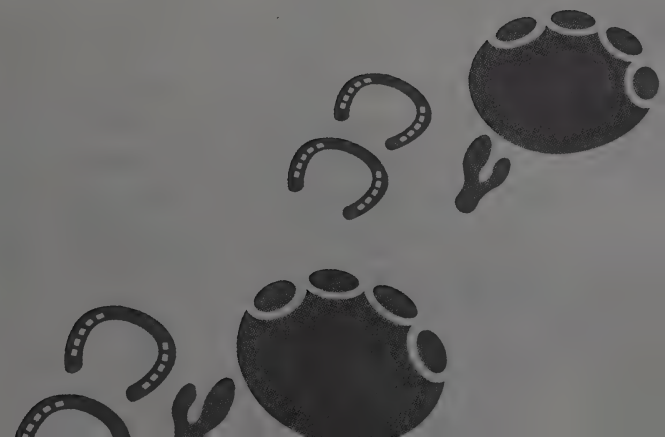
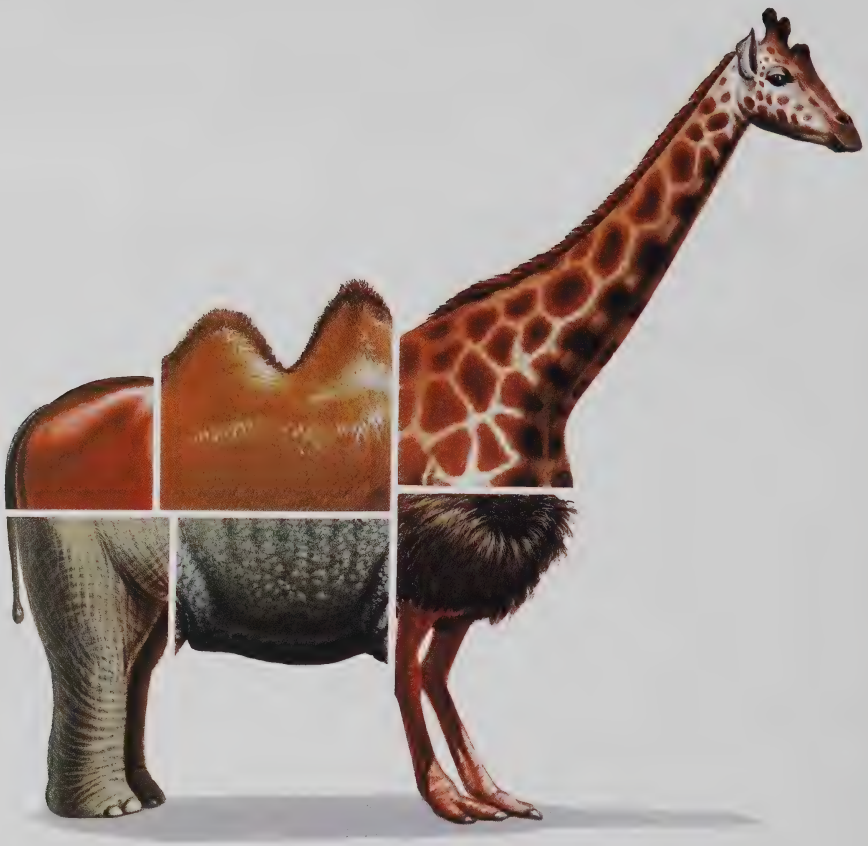
Two ways to move to ISDN voice, image and data capabilities...





Theirs.

You've been through it all before. The cable supplier says the problem's in the switches. The switch manufacturer says you bought the wrong computer. And so on. And so on.

What you really need is one single supplier for all your telecommunications equipment. Especially when you're planning a big change like the move to ISDN.

Computer experience is essential

If you plan to provide the full range of ISDN services, you'll need an equipment supplier with the full range of computer experience. To support all the levels of ISDN protocols — even the highest. To ensure total system reliability. And to make your ISDN system easy to operate and maintain.

Ours.

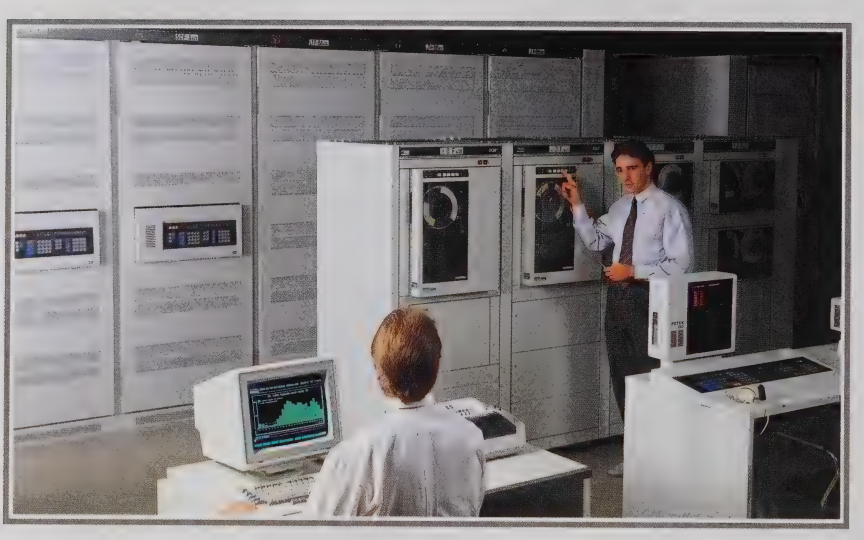
Fujitsu has been a leader in telecommunications for over 50 years. And we've supplied the digital computers to support them for over 30 years. That's why we have everything you need to make your move to ISDN smooth and trouble-free.

So, you can build an ISDN system with parts from a number of suppliers. Or you can go with Fujitsu from end to end.

With a choice like that, is it hard to pick the winner?

ISDN now. Fujitsu all the way. FUJITSU

The digital switching system built to survive the change to ISDN.



The "Future-Proof" FETEX-150

Most telephone switching systems will end up on the scrap heap when the world switches to ISDN. One that won't is Fujitsu's FETEX-150. Its modular architecture makes it "future proof".

It can handle any of today's exchange hierarchies. And its open-ended software design will handle any future ISDN hierarchies as well.

That's why FETEX-150 digital switching systems are already at work in Hong Kong, Singapore, China, Jordan, Colombia and other countries around the world. They're ready for the future of telecommunications. And that future is no longer very far away.

FUJITSU

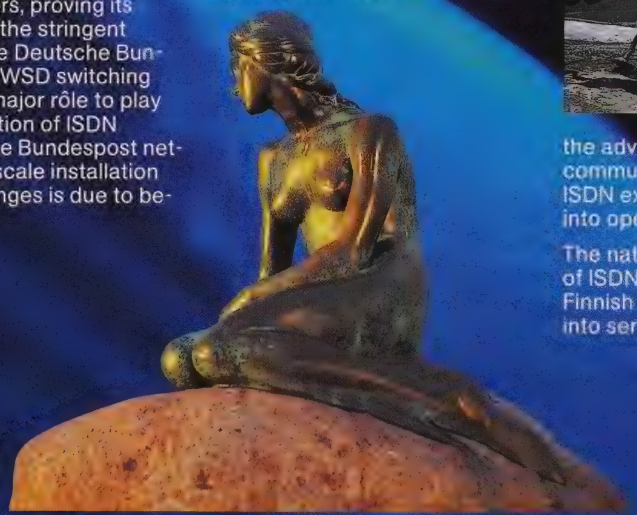
ISDN now. Fujitsu all the way.

SIEMENS

For Siemens, ISDN means business as usual

ISDN for the Federal Republic of Germany – from Siemens
An EWSD/ISDN exchange has been operating under normal conditions in Mannheim since January 1, 1987 as part of a pilot project. So far EWSD has passed all the system tests with flying colors, proving its ability to meet the stringent demands of the Deutsche Bundespost. The EWSD switching system has a major rôle to play in the introduction of ISDN to the Deutsche Bundespost network. The full-scale installation of ISDN exchanges is due to begin in 1988.

ISDN for Denmark – from Siemens
The Copenhagen (KTAS) and the Jutland (JTAS) Telephone Companies are responsible for about 90% of the Danish telephone network.
Denmark's domestic telephone network is the busiest in the world but also one of the best equipped.
In 1985 KTAS and in 1987 JTAS placed orders with Siemens for more than 225,000 EWSD line units, with an option for double this amount over the next years. Siemens will supply a number of the local and long-distance exchanges with an ISDN configuration. Full-scale ISDN is scheduled to go into operation in Denmark's urban areas by mid-1989.

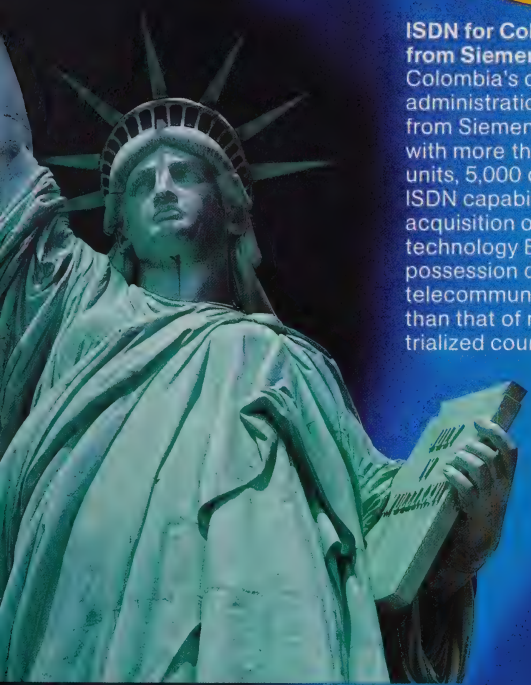


ISDN for Finland – from Siemens
The Helsinki Telephone Company (HTC), the largest member of the Association of Telephone Companies in Finland, has signed a skeleton contract with Siemens for the establishment of an Integrated Services Digital Network (ISDN). The HTC will thus be one of the world's first telecommunications organizations to offer its customers

the advantages of integrated communication. The first ISDN exchange will be going into operation in 1987.

The nationwide introduction of ISDN will be continued by the Finnish PTT, who will put ISDN into service in 1988.

ISDN for the U.S.A. – from Siemens
Five of the seven regional Bell Telephone operating companies have already opted for ISDN from Siemens. The country with the world's largest telephone network is thus preparing the way for nationwide ISDN. Siemens has been actively involved in the introduction of ISDN to the United States. The first all-digital EWSD exchanges for U.S. customers have already been delivered.



ISDN for Colombia – from Siemens
Colombia's capital telephone administration ETB has ordered from Siemens EWSD exchanges with more than 240,000 line units, 5,000 of which will have ISDN capabilities. With the acquisition of this sophisticated technology Bogotá will be in possession of a more advanced telecommunications network than that of many highly industrialized countries.

ISDN for Switzerland – from Siemens
The Swiss PTT placed an order with Siemens for the construction of an ISDN exchange at Grand Saconnex, Geneva. During Telecom 87 there was a shuttle service between the Siemens-Albis stand and this exchange. In addition to finding out about the advantages of an EWSD/ISDN exchange at the exhibition stand, visitors had the opportunity to see such an exchange in actual operation.

For further information please write to: Siemens AG, Infoservice 141/063 JU Postfach 23 48, D-8510 Fürth 2 Federal Republic of Germany

Siemens – total commitment in communications technology

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CeBIT Report

Telecommunications

* **Closer German-Japanese co-operation:** At a meeting held in Bonn the West German Post Minister, Dr. Christian Schwarz-Schilling, and his Japanese counterpart, Shungiro Karasawa, agreed to co-operate more closely in the field of postal services and telecommunications. A working party consisting of German and Japanese experts will be formed to discuss issues involving the Integrated Services Digital Network (ISDN) and broadband communications.

* **International telecommunications industry steps up its presence at Hanover:** The structural changes proposed by the Government Commission on Postal and Telecommunications Services have led to a marked increase in the number of foreign suppliers of telecommunications technology interested in exhibiting at Hanover Fair CeBIT. In particular, the USA, Great Britain, France, Japan, the Netherlands and Sweden will increase their presence at CeBIT '88 (16th - 23rd March) and will use the Fair as a springboard for sales activities in Europe and West Germany. Hanover Fair CeBIT '87 was attended by 406,000 professional visitors from throughout the world, of whom no fewer than 120,000 had a direct interest in telecommunications technology.

* **Standard mobile communications network throughout Europe:** As from 1991 it will be possible to make car-phone calls throughout Europe. At a meeting in Copenhagen the telecommunications authorities of 13 European countries declared their willingness to establish a standardized mobile communications network throughout the continent.

* **ISDN-compatible exchange systems go into large-scale production in West Germany:** The Bundespost has begun connecting up local and long-distance exchanges in certain West German cities on the basis of ISDN - the first link-up of its kind anywhere in the world. Two different types of exchange are involved - "System 12" made by SEL and the Siemens "EWSD" system. German subscribers will therefore be the first anywhere in the world to have access to new and improved communications services (voice, text, image, data) via a single plug connection. In the middle of 1988 German companies will commence the production of ISDN-compatible local-exchange and switching equipment. The Bundespost and German industry will be strongly represented at CeBIT '88 (16th - 23rd March, 1988) in Hanover, West Germany.

* **Hanover Fair CeBIT '88 - World Center for Office, Information and Telecommunications Technology:** With 2,335 exhibitors from all over the world, Hanover Fair CeBIT '88 (16th - 23rd March) is once again fully booked. Major exhibiting countries are the USA (136 exhibitors), Taiwan (110), Great Britain (108), Switzerland (68) and France (61). As the world's largest showplace for information and telecommunications technology, CeBIT will attract top managers from all over the globe. Numerous official delegations representing national postal authorities and government departments (e.g. ministerial departments for economic affairs and transport) have announced that they will be visiting the Fair. Many of these delegations will be from S.E. Asia and Europe.

Deutsche Messe- und Ausstellungs-AG, Messegelände, D-3000 Hannover 82, Telephone (5 11) 89-1, Telex 9 22 728

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Cover:

In Malaysia, Telconsult has been assisting the local telecom company–Binafon–on the installation of a new local line network. Here technicians are testing continuity of the circuit in an aerial cable

(Telconsult, United Kingdom)

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The continuing integration of telecommunications: the CCIR Interim Meetings

The continuing integration of telecommunication techniques and facilities dominates much of the current work of the ITU's Consultative Committees. The CCIR's Interim Meetings of its current study period, held last November and December, were no exception. Some of the highlights of this remarkable progression—abundantly evident at the meetings—are worth noting.

Techniques and standards for digital television—encompassing production and potentially emission—received considerable attention. High-definition television (HDTV) remains a focal point. The CCIR's most recent Plenary Assembly at Dubrovnik in 1986 urged that work on high-definition television be directed towards a single world-wide production standard before the end of the Committee's 1986-1990 study period. Further work was done at the Interim Meeting of Study Group 11 to achieve this result and to effect a digital, open-architecture environment, for the future. Relay both via satellite and terrestrial radiocommunication networks were considered. A special meeting of the CCIR Study Group 11 will be held in April 1989 in order to further the work.

For less bandwidth intensive applications, the continuing integration of systems has been equally visible for audio and broadcast auxiliary facilities. Digital techniques for sound broadcasting were further developed by CCIR Study Group 10. This included audio signal encoding parameters and digital audio recording. In recent years, CCIR Recommendations have provided basic specifications for equipment manufacturers.

A new digital stereo multiplex system is being developed to accompany television video signals. It is expected that the broad flexibility and information transparency of this system will open the way to a wide variety of different applications, well beyond the provision of stereophonic sound, leading to the adoption of a world-wide standard system.

Even in areas traditionally partitioned by radio service distinctions, the work has necessarily become somewhat integrated. For example, in the course of preparing for the Second Session of the World Administrative Radio Conference on the use of the geostationary-satellite orbit and the planning of space services utilizing it—commonly known as ORB(2), HDTV considerations have appeared, as well as sound broadcasting to portable and vehicular receivers. The ORB(2) Conference will be convened in Geneva on 29 August this year.

The use of satellites for electronic news gathering (SNG) has been growing rapidly, with the consequent need to establish operating procedures and compatible interfaces for equipment and satellites. A new Joint Interim Working Party (JIWP CMTT 4-10-11/1) was established to carry out the necessary studies and to prepare a new Recommendation and a Report.

Co-ordination of CCIR work with that of the CCITT is, of course, extremely important in order to ensure that system performance standards and interoperation techniques and operational arrangements are developed, which also, where appropriate, include meeting the demands of ISDN. The rapid development of new terrestrial and satellite technology in the mobile, mobile-satellite, fixed-satellite services are constantly followed, and liaison is occurring between CCITT Study Group XVIII and CCIR Study Groups 4 and 8 on transfer mode techniques, network architectures, performance models and interoperation requirements.

Much of this work will be referenced and used within the CCITT's Study Group XVIII, especially at the January 1988 meeting of ISDN Experts. HDTV is also one of the prime applications for the "new transfer mode" techniques being finalized in Study Group XVIII, and scheduled for rapid implementation in distribution networks of the 90s around the globe.

The CCIR Interim Meetings demonstrate the value of this ITU body for world-wide study and standardization of radiocommunication techniques and systems. The work also makes apparent the rapid integration of telecommunication technology to the point where the boundaries between services and systems have become extremely blurred. Not unexpectedly, the traditional partition between the work of the Consultative Committees based on the nature of the transmission medium is also less relevant than it once was. This will necessitate increasingly closer co-operation between those Committees in the adoption of timely standards to serve the changing telecommunication environment.

Reaching a global consensus on technical and operational matters more rapidly than in the past is increasingly important to permit sound decisions in networks and systems, as well as investment and manufacturing, in order to bring about the rapid exploitation of the new technology for the benefit of all users.

R. E. BUTLER

Union Activities

New Chairman and Vice-Chairman of the IFRB

The new Chairman and Vice-Chairman of the International Frequency Registration Board took up their duties on 1 January 1988.

The Chairman is Mr Y. Kurihara, Vice-Chairman in 1987, who succeeds Mr W. H. Bellchambers. The Vice-Chairman is Mr A. Berrada.

Mr Kurihara is a graduate of Tokyo University and received the Master of Science degree from Cornell University. Most of Mr Kurihara's career has been with the Radio Research Laboratories, Ministry of Posts and Telecommunications where his major fields of activity were: radio-wave propagation, space and terrestrial radiocommunications and radio-frequency spectrum utilization.

From 1975 to 1978 Mr Kurihara was Director of the Satellite Design Group at the National Space Development Agency of Japan. In 1978 he returned to the Radio Research Laboratories as Director of the Planning and Support Division and was appointed Director-General of the Laboratories in 1980.

Mr Kurihara was elected to the IFRB by the 37th Session of the Administrative Council (1982) and re-elected by the Nairobi Plenipotentiary Conference the same year. He served as Vice-Chairman up to the end of April 1982 and then in 1987 and as Chairman in 1983.

Mr Berrada, who has been a member of the Board since 1967, is a radio and electronics engineer. Formerly Secretary-General of the PTT Ministry of Morocco, he took part in many conferences of the Union before he was elected member of the Board by the Montreux Plenipotentiary Conference, 1965. Mr Berrada was Chairman of the IFRB in 1968, 1971, 1975, 1980 and 1984.

Centre for Telecommunications Development: the Second Advisory Board creates a fund-raising task force

The newly composed Second Advisory Board of the Centre for Telecommunications Development (CTD), appointed by the ITU Administrative Council in July 1987, met at Union headquarters in Geneva on 29 and 30 October 1987.

The Advisory Board established a fund-raising task force with the goal of obtaining contributions for the acceleration of telecommunications development in the Third World, so as to "put all mankind in easy reach of a telephone in the early years of the next century".

The Centre's plan of action for the period 1987-89 was approved in April 1987 and includes activities such as the preparation of master plans for integrated development, national sector maintenance and management plans, extension of national networks to the rural areas, training in network planning, analogue to digital conversion, etc. in developing countries.

About 30 requests for assistance from telecommunication administrations/operators in developing countries have been received by the Centre to date. Since the Centre became operational in April 1987, one dozen evaluation and assistance missions have been undertaken, as a result of which several projects and seminars will soon begin.

The Advisory Board, which guides the activities of the Centre, is composed of 12 members from the developing countries, 8 members from industrialized countries and the Secretary-General of the ITU as Senior Vice-Chairman.

The Board's members are appointed by the Administrative Council of the ITU for a period of two years. On 29 October 1987, the new Chairman and the Vice-Chairman were elected: Messrs A. D. Ntagazwa, Deputy Minister, Ministry of Communications and Works (Dar es-Salaam, Tanzania) and N. J. M. Biezen, Managing Director, Nepostel (The Hague, Netherlands), respectively.

The Centre for Telecommunications Development was established by the Administrative Council of the ITU in

July 1985 in response to the recommendations contained in *The missing link*, the report of the Independent Commission for World Wide Telecommunications Development. The objectives of the Centre are:

- to stress and promote key role of telecommunications for socio-economic development so as to enhance investments;
- to provide advisory services as well as operational and technical support;
- to raise resources and to mobilize support to initiate co-operative activities.

The Centre is a non-profit organization funded through voluntary contributions from governments, telecommunication administrations/operators, aid-agencies and industries.

CCIR News

Meeting of Interim Working Party 11/5

At the kind invitation of the Télédiffusion de France (TDF), Interim Working Party 11/5 (Protection ratios for colour television systems. Terrestrial services) held its first meeting in the present study period from 15 to 17 September 1987 in Paris (France), under its new chairman Mr S. Dinsel (Fed. Rep. of Germany).

During the previous study period, this Working Group had elaborated important documents on television planning mainly in the preparation of the First Session of the Regional Administrative Radio Conference for the planning of the VHF/UHF television broadcasting in the African Broadcasting Area and neighbouring countries–AFBC(1). Study Group 11 (Broadcasting service (television)) at its Final Meeting in 1985 recognized that this task was successfully concluded and consequently revised the terms of reference of this IWP.

At present, Decision 42-2 emphasizes work on protection ratios in terrestrial television services. Fourteen experts participated in the meeting and 20 new documents had to be studied dealing mainly with the effects of new receiver design or new ancillary services (data or digital sound) on protection ratio values to be used for television planning.

Based on a report by Mr H. Kussmann, former Chairman of IWP 11/5, the meeting discussed the outcome of AFBC(1) as far as protection ratios are concerned.

Interim Working Party 11/5 appreciated that AFBC(1) had largely accepted the results of the work of this Group presented as part of CCIR Report "Technical bases for the Regional Administrative Radio Conference to review and revise the provisions of the Final Acts of the African VHF/UHF Broadcasting Conference (Geneva, 1963)–AFBC(1)".

The decision of AFBC(1) to use a unified value of 10:1 for the ratio of picture to sound carrier for planning purposes was welcomed and will be reflected in proposed amendments to Recommendation 655. The IWP also supports amendments due to new investigations in the design of receivers used for the K1 system.

It was noted that AFBC(1) had asked for more CCIR studies on sharing between television broadcasting services and mobile service working in the same band, between 790 and 862 MHz, and for studies on the use of circular polarization in television broadcasting.

The conclusion of the meeting was that no evidence of advantages of circular polarization had been reported to this Group until now. On the other hand, its use would certainly give away the advantage which can be gained by use of orthogonal polarization in television planning. This statement mainly reflects on the opinion of European broadcasters. Experts in other parts of the world may have different experience. The IWP is willing to include studies on this subject in its work if Study Group 11 so wished.

The meeting felt that studies on sharing between various services need a much broader basis and Study Group 11 at its forthcoming interim meeting may decide, in consultation with other Study Groups, how these studies have to be organized.

Table XI in Recommendation 655 gives only the protection ratio figures for wanted television sound carriers when they are directly influenced by an unwanted carrier nearby the wanted sound carrier.

For co-channel interference, it was reported to the IWP that intercarrier demodulation in the television receiver may cause additional interference to the sound channel, when an unwanted vision carrier lies nearby the wanted vision carrier, for example 1/3 or 2/3 offset (frequency difference 5 or 10 kHz). In many co-channel carriers, especially with precision offset, the sound-protection ratio is higher than the vision-protection ratio. As a consequence it could be necessary to increase in such cases the frequency offset by 1 or 2 multiples of the line frequency. Until the Final Meeting of Study Group 11 (1989), further studies are necessary to modify Recommendation 655.

New studies in France indicate the possible need to modify protection ratio values for overlapping channel interference when the sound carrier is amplitude

modulated. Further studies are necessary to confirm the findings and administrations are invited to carry out more tests.

The IFRB reported to the IWP that insufficient information is available in CCIR texts on the out-of-channel response of receivers. This led to difficulties in elaborating the computer program for AFBC(2). Due to the lack of basic information on this subject, the IWP is not in a position to advise the IFRB. Further studies on a large variety of receivers are needed but new results are not expected very soon.

Related to image channel interference research work was done recently in the Federal Republic of Germany and in France. The results show that new receivers presently manufactured have a much better performance than the older ones and the protection ratio could be reduced by 10 dB. Since the old type receivers are still widely used, new values cannot be recommended for general use at this time.

The French studies indicate in addition that for image channel interference K1 receivers are not worse then receivers for other television systems and Recommendation 655 should be corrected accordingly. The proposed modifications to this Recommendation will also reflect that K1 receivers presently on the market employ different intermediate frequencies: 32.7, 38.9 and 40.2 MHz.

The influence of digitally modulated sound in television is now under study in various countries. The IWP noted on this subject a number of contributions to the Interim Meeting of Study Group 11 but was not in a position to discuss the matter in detail due to the absence of representatives of the contributing administrations in the IWP. Most of the available protection ratio figures were measured with laboratory equipments. Measurements with domestic receivers should be made until the Final Meeting of Study Group 11.

Data signals transmitted together with the television signal will have an impact on protection ratio values since part of the spectrum of those signals, having still high energy components, falls partly in the upper range of the lower adjacent channel. Studies on this subject will continue until sufficient information for recommended values is available.

The meeting discussed the use of synchronized carrier operation under the precision offset condition. This mode is regarded as a promising tool for better coverage in cases where no additional frequencies are available. Studies on this subject should have high priority during the remaining part of this study period. Participants in the work of IWP 11/5 are encouraged to initiate such work.

A possible text for a reference receiver specification was submitted by the European Broadcasting Union (EBU). Study Group 11 confirmed already, during previous study periods, that a reference receiver could provide useful support for planning a television service. A number of participants nevertheless felt that, apart from the benefits for planning, such a document could have a negative impact on future receiver design. Manufacturers might not be interested to improve their receivers if these meet already the parameters of a reference receiver on which planning is based. Study Group 11 will be asked for advice on how to proceed until the end of the study period.

Taking into account that the deadline for contributions to Study Group 11 Interim Meeting has already passed, the IWP decided that the report of its present meeting should be as short as possible and that the Chairman should include only those texts for which confirmation by the Final Meeting would be too late, for example, which are relevant to AFBC(2).

Based on such considerations the Group decided on priorities for its future work. The next meeting of IWP 11/5 is proposed to be held between September 1988 and April 1989.

S. D.

Meeting of Interim Working Party 5/1

Interim Working Party 5/1 (Influence of the surface of the Earth and aspects of tropospheric propagation of general interest) met in Stockholm from 10 to 13 November 1987, under the chairmanship of Dr A. Blomquist (Sweden). Eight national administrations were represented.

The Interim Working Party is responsible for studying the practical application of meteorological, topographical and geological data to the prediction of the phase and amplitude of radio waves propagated over the surface of the Earth and through the non-ionized regions of the atmosphere. Additional responsibility involves the provision of texts of general interest in the work of Study Group 5 (Propagation in non-ionized media) which incorporate matters common to several sections of CCIR Volume V.

In accordance with CCIR Resolution 72, preparations are in hand for the production of a handbook of curves for propagation over the surface of the Earth, covering the frequency range 10-10 000 MHz. The curves are calculated for propagation over a smooth, spherical Earth, with the refractive index of the troposphere varying exponentially with height, and for various values of electrical characteristics and antenna heights. Having over-

come earlier difficulties with the computerized computation of the curves, the CCIR Secretariat was able to present many examples to the meeting for examination. Certain modifications were proposed, mainly involving presentation, and these shall be reflected in future versions of the curves currently in preparation.

The ground-wave curves contained in Recommendation 368 make no allowance for the effect of the near field at short distances. To alleviate this shortcoming, the meeting identified a suitable correction formula for inclusion in the Recommendation, at the same time proposing that the curves be re-drawn using values of ground conductivity, with corresponding values of permittivity, derived from Recommendation 527.

Much consideration was given to the texts in Volume V addressing propagation by diffraction. Whilst it was felt that Report 715 contained a clear theoretical approach to basic diffraction problems, it was recognized that information concerning multiple knife-edge paths was lacking. Also, consideration was given to the incorporation of self-contained prediction methods for irregular terrain. The meeting prepared proposals covering both of these aspects.

Recent measurements in Norway of the phase of LF and VLF signals were presented to the meeting. The work showed variations in the phase of the ground-wave due, in turn, to variations in electrical characteristics over the propagation path and to seasonal climatic changes. Such phase variations have important consequences for direction finding systems such as LORAN-C. A brief quantification of the results of this work was prepared at the meeting for possible insertion in Report 716.

The principal results from the meeting shall be submitted to the Interim Meeting of Study Group 5 to be held in Geneva in April 1988.

A. B.

CCITT News

Meeting of Working Party III/2

Working Party III/2 (Tariffs and accounting principles to be applied in public international data networks) held its fourth meeting for the 1985-1988 study period in Ottawa (Canada) from 19 to 21 October 1987, under the chairmanship of Mr J. O'Boyle (United States).

In reviewing the agenda, the chairman noted that there were three areas which required concentrated efforts during this meeting. The first area, message handling systems and interpersonal messaging services, was clearly ready for a Recommendation since this subject had been discussed in detail since the beginning of this study period and many administrations have either announced plans or have introduced this service. The second area of concentration should be developing a Recommendation on interworking between the different types of international public data networks. Again, the urgent work is required because we are entering a period when interworking will become very important to many administrations. A final key item would be to develop meaningful and succinct new and/or revised Questions that will assist us in the organization of our future work.

During the discussion related to the specific Questions assigned to Working Party III/2, the following issues were particularly highlighted:

Question 6/III

(Message handling system–MHS/interpersonal messaging system–IPMS services)

After reviewing contributions from Canada, the United States and France, Working Party III/2 finalized a draft Recommendation concerning charging and accounting principles on interpersonal messaging (IPM).

As a subset of the above discussion, Working Party III/2 and Mr D. McKnight (Canada), the Special Rapporteur for MHS from Study Group I (Definition, operation and quality of service aspects of telegraph, data transmission and telematic services (facsimile, teletex, videotex, etc.)), conducted various exchanges of view regarding MHS and IPM services.

Development of tariff principles for directory services was deferred until the next study period.

Question 7/III

(Reverse charging, Alternative No. 2)

As a result of a contribution from France, Working Party III/2 agreed to amend Recommendation D.30 concerning Alternative No. 2 of a reverse charging.

The TEUREM Group (Tariffs (Europe and the Mediterranean Basin)) introduced a contribution which noted that (after a cost study) calls on the packet network would be accounted for *only on the volume of traffic* and not for duration and volume (this was provided to Working Party III/2 for informational purposes only). However, several administrations indicated that they are considering submitting a contribution to Study Group III (General tariff principles including accounting) proposing this change in accounting on a worldwide basis. Collection rates would continue to be levied on both volume and duration.

Question 8/III

(Fixed transit rates)

As a result of a contribution from the Federal Republic of Germany, Working

Party III/2 agreed to amend Recommendation D.20 to add a provision for the remuneration of the costs of transit facilities by means of *fixed transit rates.* (This method would be in addition to a percentage of the accounting rate which is the existing Recommendation.)

Question 9/III

(Interworking)

As a result of contributions from the Federal Republic of Germany and France and discussions which had taken place earlier in Working Party III/6 (Tariffs and accounting for the services offered on the ISDN) and joint Working Party III/6-III/2, Working Party III/2 was able to develop an extensive Recommendation on general charging and accounting principles for non-voice services provided by interworking between public networks.

Question 10/III

(Multi-tier charging)

As a result of requests by several administrations and user groups, Working Party III/2 agreed to finalize Recommendations for special tariff principles for short transaction transmissions on the international packet switched public data network using the fast select facility with restriction.

New Questions

As a result of a detailed contribution from Canada, Working Party III/2 was able to agree to modify and condense its existing five Questions into three new Questions based on:

- General tariff principles associated with all types of data communication on public data network.
- General tariff principles associated with public packet switch network.
- General tariff principles associated with public circuit switch network.

J. O'B.

Meeting of Working Party III/5

Working Party III/5, responsible for the studies of charging and accounting provisions in the new Regulations (Questions 24 and 25/III) as well as tariff and accounting guidelines for value-added services (Question 21/III), met at the kind invitation of Canada at the Government Conference Centre in Ottawa from 21 to 23 October 1987, under the chairmanship of Mr T. Matsudaira (Kokusai Denshin Denwa Co., Ltd.—KDD, Japan), assisted by the Vice-Chairman Mr M. Ribeiro (France).

Some 70 participants from 23 countries were in attendance.

1. Regulatory studies

This was the seventh meeting of the Working Party since its establishment in spring 1985. During the preceding meetings, the Working Party had concentrated its work on the important task of drawing up Article 6 of the draft International Telecommunication Regulations, covering the basic principles of:

- collection charges;
- accounting rates;
- monetary units;
- establishment of accounts;
- settlement of balances of accounts;
- service and privilege telecommunications.

The draft Article 6, as proposed by Working Party III/5 was approved at the fourth and the final meeting of the Preparatory Committee WATTC-88 (PC/WATTC-88) held in Geneva in April 1987.

It might be useful at this time to review briefly the work of Working Party III/5 (and Study Group III—General tariff principles including accounting) in drafting the new regulatory provisions.

1.1 The Working Party started its work by reviewing all provisions in the Telegraph and Telephone Regulations of 1973 as well as Appendix 1, and consolidated the necessary provisions into a single article in the body of the new Regulations.

1.2 Based on numerous contributions received, some new provisions have been incorporated. The most important of these is probably the definitions of ITU's two monetary units (to be applied in the absence of special arrangements). In this connection, it might be worth noting that several administrations pointed out the desirability of deleting the gold franc altogether as the ITU's monetary unit, particularly because the gold franc is now defined in terms of the SDR. This matter was certainly outside the competence of Study Group III, or for that matter, of CCITT. The issue is likely to come up at the next Plenipotentiary Conference.

1.3 Working Party III/5 has tried to shorten Article 6 as much as possible, so that some provisions in the current Regulations have been dropped. It is clearly recognized that Article 6, in comparison to other articles in the draft Regulations, is still lengthy. However, it was the unanimous feeling of the experts in Working Party III/5 and throughout the study period that necessary provisions regarding money and money transactions should be clearly set out in the Regulations, rather than in Recommendations.

2. At the Ottawa meeting, Working Party III/5 dealt with some consequential issues arising out of the regulatory studies.

The first was the treatment of Recommendation D.195 (Settlement of international telecommunication balances of accounts) whose purpose of existence will in fact terminate with the adoption of the new Regulations. Considering the expected timing of the entry into force of the new Regulations, Working Party III/5 decided to include some words in the Recommendation to the effect that the Recommendation would cease to be valid after the new Regulations enter into force.

The second was the drafting of a new Recommendation on "privilege telecommunications" (now known as "franking privilege telecommunications"). This task was completed, and the novelty worth mentioning here is the possible substitution of private telephone calls with private telegrams, with 100 and 50 word telegrams representing 6 and 3 minute telephone calls, respectively, when telephone service is not available for some reasons.

3. Value-added services

This is indeed a difficult Question since the term "value-added service" is not and probably cannot be defined at an international level. The highly interesting exchange of views on the matter in Working Party III/5 has revealed that even if the study is confined to services provided by and between administrations and recognized private operating agencies, it is premature to draft any guiding principles on tariff and accounting, since the conclusion of the role of the ITU with regard to these types of new services is yet to be reached at the WATTC-88.

Discussions continued in Working Party III/5 whether to propose the continuation of Question 21/III in the CCITT study period 1989-1992. There was a divergence of views on the need and desirability to study further the so-called "value-added services" but the Working Party was almost unanimous in seeing a need to have a Question under which certain new services not specifically covered by other Questions can be dealt with.

Accordingly, a new Question was drafted at the Ottawa meeting to be proposed to the Final Study Group III meeting in May 1988.

T. M.

CCITT "Red Book" translated into Korean

A complete set of CCITT *Red Book*, translated into Korean, has been donated to the Secretary-General of the ITU, Mr R. E. Butler, by Mr Young Il Kang who is in charge of the technical information centre in the Electronics and Telecommunications Research Institute (ETRI).

880040

Mr Young Il Kang (left) presenting one volume of the set of the Red Book to Mr R. E. Butler

More than 20 experts, including professors and engineers, were engaged in this task which was completed in only one year.

This activity is part of the ETRI's programme to promote the international standardization movement in a more active way.

Obituary

Ian F. Macdiarmid

Ian F. Macdiarmid died on 1 October 1987, aged seventy. For many years a member of the United Kingdom delegation to the CCIR and the CCITT, he was one of the world's leading television transmission experts.

One of his most important innovations was the development, together with Dr N. W. Lewis, of pulse and bar waveforms for television system testing. The techniques provide the bridge between what is practically needed to run a television service and laboratory endeavours. His concepts are contained in CMTT Recommendation 567, which he helped to prepare. Ian's life-work was essentially to translate ideas from research and development into practical, usable tools which could be understood and applied by everyone.

Widely known and respected in the CCIR and the CCITT, Ian was often asked to chair Working Groups on television and teletext matters, and his affable and persuasive personality served him well.

Ian joined the General Post Office in the United Kingdom in 1937 and in 1948 was involved in setting up the Research Branch Television Group. Since that time, he was involved in the initial transcontinental television exchanges via *Telstar*, the studies in colour television systems and the United Kingdom viewdata system. Outside the broadcast arena, he was active in confravision in CCITT Study Group XV.

Although he retired from British Telecom Research Laboratories (BTRL) in 1977, this certainly did not lead to a

lessening of his dedication to the CCIR and the CCITT. He became a consultant to BTRL and continued to represent the United Kingdom.

He was, for example, involved in the 4:2:2 digital television discussions in CCIR Study Group 11 in the early 1980s. He coined the notion of an extensible family of standards. Later, on a procedural level, he devised the artifact of a draft Recommendation annexed to a Report, as a means of providing a pre-recommendation state for system specifications.

One of his areas of greatest personal interest was subjective assessments of picture quality, and his contribution to the CCIR documents on the subject was considerable. It continued until the most recent times. He played a most active part in CCIR Interim Working Party 11/4 (Subjective assessment of television picture quality) including at a meeting in June 1987. He read a paper on assessment methods at a conference on television measurements in June 1987.

Our loss is considerable, but he leaves a lasting legacy of knowledge and diplomacy. In stature and in spirit, Ian Macdiarmid was a big man.

Technical Co-operation

Development of research facilities in the Republic of Korea

A contract was signed on 19 November 1987 at ITU headquarters by Mr Duncan M. McIntosh, Co-Chairman of Spectrum Planning, Inc., (Texas, United States), and Mr R. E. Butler, Secretary-General of the ITU for a technical co-operation project in the Republic of Korea.

The Government of the Republic of Korea is implementing its 15-year telecommunications programme (1985-2001) for the expansion of the network and is developing further its research facilities to support local manufacture of telecommunications equipment and related products.

The research programmes in the telecommunication field are executed by the Electronics and Telecommunications Research Institute (ETRI), situated in Daeduk, in the Daejon area. The Government requested the assistance of the United Nations Development Programme (UNDP) and the ITU in further developing the research facilities in the country.

It was subsequently agreed by the Government and the UNDP that the ITU would engage a subcontracting consultancy office in charge of recruiting nine telecommunication experts to assist ETRI in carrying out research and development mainly in quality control and reliability analysis, frequency spectrum management, mobile telecommunications, optical-fibre systems, digital video codecs and satellite communications and in defining the related training programmes for the 23 trainees considered as being necessary to continue these tasks once the consultancy office had finished its work.

For this purpose, the ITU invited seven consulting companies to submit tenders.

The consultancy services, which are expected to be completed within three years, were subcontracted by the ITU to Spectrum Planning for a total amount of 1 229 855 United States dollars.

The project is scheduled to commence operations not later than June 1988.

880041

From right to left: Messrs Duncan M. McIntosh, Co-Chairman of Spectrum Planning, Inc.; R. E. Butler, Secretary-General of the ITU; J. Jipguep, Deputy Secretary-General of the ITU

Master Plan project for Lao People's Democratic Republic

In pursuance of the development strategy set forth in its second five-year development plan, 1986-1990, the Lao People's Democratic Republic is making a major effort to improve the basic infrastructure in the country. In order to assist the Government of the Lao P.D.R in realizing the objectives for the telecommunication sector, the ITU has agreed to undertake a technical co-operation project within the framework of the United Nations Development Programme (UNDP) fourth country programme with a total input of 1659 million United States dollars (USD).

The main objective of the project is to assist the State Entreprise for Posts and Telecommunications, to manage effectively all postal and telecommunication services in the country. The project envisages the preparation of a master plan for the development of telecommunication services up to the year 2000. The first phase of this plan will include complete rehabilitation of equipment and installations in Vientiane and the four provinces. It is foreseen that the project will lead to the setting up of a planning and programming unit which will be capable of preparing medium- and long-term development plans and assist in the implementation of training programmes which will enable the Administration to overcome the existing shortage of trained staff.

880042

From left to right: Messrs J. Iseli, Executive Vice-President of Motor Colombus, Inc. and R. E. Butler, Secretary-General of the ITU

In agreement with the UNDP and the Government, the ITU has decided to subcontract the main activities of the project to a consultancy office. This will, in particular, be responsible for providing the services of experts in planning, financial management, accounting and administration, radiocommunication, telephone switching, testing and acceptance of telephone exchange equipment and maintenance planning. The experts will conduct on-the-spot training of EPTL employees and hold consultations in Vientiane in regard to the definition of training programmes which will cover a variety of disciplines.

The consultancy service, expected to last three years, has been subcontracted by the ITU to Motor Columbus Inc. in Switzerland at a total sum of 1 348 602 USD. The contract was signed on 21 October 1987 by Mr J. Iseli, Executive Vice-President of Motor Colombus, and Mr R. E. Butler, Secretary-General of the ITU. The project commenced operations in November 1987.

Departures on mission

country and place of assignment	expert	title of post	period of contract and programme*
Brazil Brasilia	Daffix R. (France)	Specialist in labour relations	8.12.87-19.12.87 UNDP
Campinas	Ivanek F. (Yugoslavia)	Specialist in digital microwave radio at the Research and Development Centre	11.12.87-20.12.87 UNDP
Haiti Port-au-Prince	Sosnowski J. (Poland)	Senior expert in switching systems planning	13.12.87-12.12.88 UNDP
India Bangalore	Nagaranjan V. (India)	Specialist/lecturer for the seminar on "Quality assurance aspects of optical-fibre cables, systems and components"	26.12.87-9.1.88 UNDP
	Wingstrand S. (Sweden)	Specialist/lecturer for the seminar on "Quality assurance aspects of optical-fibre cables, systems and components"	26.12.87-9.1.88 UNDP
Indonesia Jakarta	Tuokko E. K. (Finland)	Expert in maintenance and repair of radio-frequency monitoring equipment	1.12.87-29.2.88 UNDP

country and place of assignment	expert	title of post	period of contract and programme*
Netherlands Antilles Curaçao	Kuosmanen M. J. (Finland)	Specialist in digital transmission systems	22.11.87–4.12.87 FT
Peru Lima	Castany J. R. (France)	Specialist in preparation of training courses (regional)	18.10.87–18.10.88 FT
Switzerland Geneva	Abbro F. (Italy)	Expert in telecommunication network planning (feasibility study) for the Regional African Satellite Communications System for the development of Africa (RASCOM)	1.12.87–30.11.88 FT

*UNDP = United Nations Development Programme.
FT = Funds-in-Trust.

Official Announcements

REGIONAL AGREEMENT CONCERNING THE MF MARITIME MOBILE AND AERONAUTICAL RADIONAVIGATION SERVICES (REGION 1) (GENEVA, 1985)

The Government of the **Hungarian people's Republic** has approved the above-mentioned Agreement.

PROTOCOL AMENDING THE REGIONAL AGREEMENT FOR THE AFRICAN BROADCASTING AREA (GENEVA, 1963) ESTABLISHED AT GENEVA ON 13 AUGUST 1985

The Administration of the **Republic of Kenya** has approved the above-mentioned Protocol.

INTERNATIONAL TELEGRAPH AND TELEPHONE CONSULTATIVE COMMITTEE (CCITT)

The recognized private operating agency *Tymnet, Inc.*, San Jose (California), which participates in the work of the CCITT, has changed its name and is now called **MDC-TYMNET.**

The organization, **Anderson Jacobson Inc.**, San Jose (California) has re-established its participation in the work of the CCITT.

VACANCY NOTICES

Circular letters which have been sent to all Members of the Union announce the following vacancies:

- a post of **financial systems analyst, grade P. 4,** to be filled in the General Secretariat (Computer Department) as soon as possible (circular letter No. 201 of 7 December 1987; vacancy notice No. 33-1987 ITU; final date for submission of applications: 7 March 1988);
- a post of **Head of the Fixed and Mobile Services Division, grade P. 5,** to be filled in the Specialized Secretariat of the IFRB (Regulatory and Engineering Department) as soon as possible (circular letter No. 202 of 10 December 1987; vacancy notice No. 34-1987 ITU; final date for submission of applications: 10 March 1988).

Only applications forwarded through administrations can be taken into account; detailed applications with ITU personal history forms should be submitted to the General Secretariat of the ITU, Place des Nations, CH-1211 Genève 20 (Switzerland), not later than the final dates mentioned above.

CALENDAR OF ITU CONFERENCES AND MEETINGS

DATE	TITLE	PLACE
1988		
16-21 May	**Americas TELECOM 88—International Exhibition and Specialized Session of the World Telecommunication Forum**	**Rio de Janeiro**
16-21 May	**Policy Symposium on Telecommunications**	**Rio de Janeiro**

DATE	TITLE	PLACE
23 May-9 June	**Regional Administrative Radio Conference to establish a plan for the broadcasting service in the band 1605-1705 kHz in Region 2** (Second Session)—BC-R2(2)	**Rio de Janeiro**
20 June-1 July	**43rd Session of the Administrative Council**	**Geneva**
29 August-5 October	**World Administrative Radio Conference on the use of the geostationary-satellite orbit and on the planning of space services utilizing it** (Second Session)—ORB(2)	**Geneva**
14-25 November	**IXth CCITT Plenary Assembly**	**Melbourne**
28 November-9 December	**World Administrative Telegraph and Telephone Conference**—WATTC-88	**Melbourne**
	International Radio Consultative Committee (CCIR):	
	(Interim Study Group meetings)	
11-26 April	Study Group 5 (Propagation in non-ionized media)	Geneva
12-19 April	Study Group 7 (Standard frequencies and time-signals)	Geneva
13-26 April	Study Group 1 (Spectrum utilization and monitoring)	Geneva
20 April-6 May	Study Group 8 (Mobile, radiodetermination and amateur signals)	Geneva
27 April-5 May	CMV (CCIR/CCITT Joint Study Group for vocabulary and related subjects)	Geneva
27 April-10 May	Study Group 6 (Propagation in ionized media)	Geneva
	(Interim Working Party meetings)	
5-7 April	Interim Working Party 11/4 (Methodology of subjective testing and evaluation of television picture quality)	Las Vegas
25-26 April	Interim Working Party 6/14 (Technical requirements for the measurement, recording and analysis of ionospheric field strength data at HF)	Geneva
4-6 May	Joint Interim Working Party 10-11/4 (Digital television tape recording)	Geneva
27 June-1 July	Interim Working Party 1/5 (Updating of the Handbook for monitoring stations)	Washington
1-10 August	Joint Interim Working Party 8-10/1 (Continuation of studies on compatibility between the aeronautical radionavigation service in the band 108-117.975 MHz, the aeronautical mobile (R) service in the band 117.975-137 MHz and the FM sound broadcasting stations in the band about 87-108 MHz)	Helsinki
	International Telegraph and Telephone Consultative Committee (CCITT):	
	(Final meetings before the IXth Plenary Assembly)	
1-4 February	Study Group XII (Transmission performance of telephone networks and terminals)	Geneva
3-10 February	World Plan Committee	Lisbon-Estoril
8-12 February	Study Group IX (Telegraph networks and terminal equipment)	Geneva

DATE	TITLE	PLACE
8-19 February	Study Group VIII (Terminal equipment for telematic services (facsimile, teletex, videotex, etc.))	Geneva
15-23 February	Study Group II (Operation of telephone network and ISDN)	Geneva
7-11 March	Working Parties of Study Group IV	Geneva
14-18 March	Study Group IV (Transmission maintenance of international lines, circuits and chains of circuits; maintenance of automatic and semi-automatic networks)	Geneva
21-30 March	Study Group X (Languages and methods for telecommunications applications)	Geneva
21-31 March	Study Group VII (Data communication networks)	Geneva
11-22 April	Study Group XV (Transmission systems)	Geneva
12-15 April	Network Management Development Group (NMDG) of Study Group II	Albufera (Portugal)
18-21 April	Quality of Service Development Group (QSDG) of Study Group II	Albufera (Portugal)
25-29 April	Study Group XVII (Data transmission over the telephone network)	Geneva
2-6 May	Study Group V (Protection against dangers and disturbances of electromagnetic origin)	Geneva
9-13 May	Study Group VI (Outside plant)	Geneva
10-18 May	Study Group I (Definition, operation and quality of service aspects of telegraph, data transmission and telematic services (facsimile, teletex, videotex, etc.))	Geneva
16-27 May	Study Group XI (ISDN and telephone network switching and signalling)	Geneva
30 May-7 June	Study Group III (General tariff principles including accounting)	Geneva
6-17 June	Study Group XVIII (Digital networks including ISDN)	Geneva
August*	Co-ordination Committee of the Plan Committee for Latin America	Montevideo
14-25 November	**IXth Plenary Assembly**	**Melbourne**
	International Frequency Registration Board (IFRB):	
4-11 March	Seminar on frequency management and the use of the radio frequency spectrum and the geostationary-satellite orbit	Geneva
14-16 March	HFBC Information Meeting	Geneva
16-18 March	ORB Information Meeting	Geneva

DATE	TITLE	PLACE
1989		
23 May-29 June	**Plenipotentiary Conference**	**Nice**
3-9 October	**ITU-COM 89—1st World Electronic Media Exhibition and Symposium**	**Geneva**

* Date to be confirmed in due course.

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Conferences or meetings external to the ITU

Seminar on transmission planning aspects of analogue-digital mixed networks

1. Introduction

The seminar on transmission planning aspects of analogue-digital mixed networks took place at Boglárlelle (Lake Balaton, Hungary) in the summer hotel of the Hungarian P&T Administration. The seminar was held from 12 to 14 May 1987, immediately after the meetings of the International Telegraph and Telephone Consultative Committee (CCITT) Working Parties XII/3 (Transmission quality and opinion models) and XII/4 (Transmission objectives and planning) at the same location.

Thirty-two experts from 16 different countries and 36 engineers from Hungary participated in the seminar. There were 18 lectures and four panel discussions of which fifteen texts were printed and distributed among the participants.

The opening address was made by Dr F. Valter, Vice-President of the Hungarian P&T. He emphasized how timely the seminar was for the government, administration and experts. In most countries with advanced telecommunications, the digitization strategy implies a principle "from top towards the bottom" and this method seems to be the most economic. But for the Hungarian Administration the conditions for the above method are not available. He outlined the problems of the transition period at the Hungarian P&T. The national development of SPC is temporarily limited to the PBX family and to the rural devices. However, digital transmission means are available. But a special type of digitization strategy which requires greater prudence and a precise definition of the technical parameters are needed. In order to overcome these problems in an economical manner and without degradation in the service quality, thorough technical considerations are essential, some of which can be hopefully elaborated on the basis of experience obtained in the seminar.

After the opening address, the first speaker was Professor K. Géher (Hungary). He summarized advances on electronic circuit theory, digital signal processing, and information theory. Results in optical signal processing and optical fibre communications were given. He presented some new achievements in radiocommunication including satellite and terrestrial systems. From the field of communication networks, the communication protocols, the local area networks and the switching systems were also mentioned. The lecture had been prepared for the International Union of Radio Science (URSI). The *URSI Review of Radio Science* was provided for the delegates as part of their registration materials. The review was based on the contributions sent by the official members of the various countries.

2. General aspects of transmission planning

The most important results and further objectives of studies in CCITT Working Party XII/4 were summed up by the Chairman, Mr G. Lajtha (Hungary) having just finished the Working Party's regular meeting the day before (see report in the *Telecommunication Journal,* October 1987, pages 642-644).

One of the most important tasks of this Working Party is to create new measures for evaluating and testing the mixed multi-service connections. These measures must be objective and have to correlate with the primary–subjectively tested, "natural"–parameters (e.g. with the MOS = mean opinion score). This proved not to be a simple task; a number of promising proposals have been provided by the countries, e.g.: information index (France), which is a weighted amalgamation of a lot of quality parameters; signal to total noise ratio (Japan), in which the noise is composed of the circuit noise and of the MOS equivalent white noise of the quantizing distortion; cepstrum distance method (Japan) and the PARCOR evaluation (Hungary). This study will be continued.

The summit of the Working Party's results is the acceptance of the generic use of the loudness rating (LR) in the transmission plan, though prompt introduction of LRs instead of the existing

corrected reference equivalents (CREs) does not seem possible in some countries. A group of Recommendations had for this reason been basically amended using LR values only referred to 0 dBr points, which are the "exchange test points" defined earlier for the international gateway exchanges.[1]

Mr Lajtha concluded that in every new situation, new Recommendations are necessary to fit the network to the required need of subjective quality.

Fundamentals of transmission planning, a lecture by Mr J. Pyddoke (Sweden), raised two questions: What does a transmission plan seek to do? What constitutes a satisfactory conversation?

The purpose of a country's transmission plan is to tell the planning staff what performance is to be looked for, i.e. what can be regarded as constituting a satisfactory call with acceptable statistical deviation and what is needed to implement these requirements (the basics of planning are dealt with the ITU's "General network planning" Handbook, the transmission chapter of which is under current study by Study Group XII (Transmission performance of telephone networks and terminals)). On the score of subjective performance targets, there is a fairly general agreement on CCITT Recommendations, however at the same time the CCITT recognizes different technical solutions to implement various or individual plans saying how much each part of the national network may contribute to the total acceptable performance degradation.

In the rest of his paper the author gave a review of the most important impairments on the score of planning. The measure of noise and interference is at present entirely based on analogue techniques and so are the attenuation frequency characteristics. Experiments have made it clear that in fact the long-line transmission did not contribute nearly so much to the frequency distortion as did the local network. Today active systems are to be implemented in the lowest level, e.g. below the local exchange, this analogue performance should likely be improved. One interesting current development is that with low bit-rate digital coders (e.g. 16 kbit/s for digital mobile service) the redundancy in the signal should be eliminated causing this way a delay of syllable length, which probably exceeds the prescribed limits. Achieving acceptable limits for echo (and stability) depends on keeping reflexions low as seen from transit centres, which means adequate losses round the end of the 4-wire loop. For the LRs, CCITT specifies only what is to be respected at the test point of the international exchanges and the subdivided values are to be planned according to the very advantageous law of addition of this measure (simple algebraic summa).

Transmission planning directives of the handbook "General network planning" was the title of the paper of Mrs Z. Zivić and Mr Z. Tomić (Yugoslavia) dealing with the directives and the transmission plan performances in mixed analogue digital network. This handbook was prepared by Autonomous Working Parties GAS 3 and GAS 6 before 1980. It was decided by the CCITT that its Chapter V (Fundamental transmission plan) should be amended by Study Group XII. An *ad hoc* Working Party prepared a new version of up-to-date text of this chapter for the seminar. Exhausting directives and instructions are given in order to provide the subscriber with good quality and to reach optimum technical-economic solutions. The authors go through all the important transmission performances–taking the basis of the model compositions of analogue-digital connections–as the CREs and LRs, transmission losses, quantizing distortion, slips, bit error ratio (BER), jitter, wander, etc.

3. Impedances, levels, stability

In the mixed analogue-digital network there are more than one 4-wire loops. The roundtrip loss of the loops must be large enough to ensure the stability of the connection and to minimize the effect of hollowness and echo when no echo cancellors are used. This problem was touched in several papers discussing transmission planning in detail with this problem. The first speakers of this session were Messrs E. Stamminger and H. Dobsak (Austria).

In their paper, titled as *Determination of the balance impedance at the Z-interface of digital local exchanges*, the authors examine the problem of the 4-wire loop nearest to the subscriber. In several cases there is a need to change over from the 2-wire subscriber line to the 4-wire digital exchange. For an adequate performance of the 2/4-wire conversion in digital local exchanges, the balance impedance has to be optimized to represent the existing subscriber loop plant. For economical reasons with respect to system design and operational problems only one compromise balance impedance for all subscriber loops should be aimed at. To find the best compromise 1228 subscriber numbers have been randomly sampled from the Austrian telephone directory. This sample size was based on statistical considerations (average cable length within a 95% confidence interval of ± 100 m). The complex input impedance of the typical station set has been measured at 11 frequencies between 200 and 4000 Hz.

In calculating the impedance of the subscriber loops at the exchange side, the subscriber loops were represented by their cascade matrices.

In order to optimize the values of the three components R_s, R_p and C_p, two different functions of matching quality were applied to the impedance of all loops.

A systematic searching method was used to find the optimal network. The start position was the approximated mean impedance (three-element network) of the subscriber lines. The limits of variation of the network elements were $\pm 20\%$ and the step size was 10% of the start values. One hundred and twenty-five combinations had to be calculated, requiring 27 computer hours.

Using the minimum function the result was: R_s = 208 ohms, R_p = 671 ohms, C_p = 115 nF.

Using the maximum function the result was: R_s = 208 ohms, R_p = 790 ohms, C_p = 115 nF.

To realize the computed network the authors decided to adopt one of the examples of echo test networks planned to be used by some administrations (CCITT draft Recommendation Q.5x7, May 1983). The echo test network with the nearest values to the author's results was chosen. These values were: R_s = 220 ohms, R_p = 820 ohms, C_p = 115 nF.

The transhybrid loss of all samples was better than 10 dB between 300 and 3400 Hz, and better than 14 dB between 500 and 2500 Hz. The mean values of the transhybrid loss for all 1228 loops and the 11 frequencies are for the three cases:

- 600 ohms termination: 23.9 dB;
- telephone sets equipped with transmitter and receiver inset of manufacturer A: 26.6 dB;
- telephone sets equipped with transmitter and receiver inset of manufacturer B: 26.7 dB.

The open loop loss (OLL) in digital local exchanges with such transhybrids can be determined by the sum of two transhybrid losses. Consequently the OLL is better than 28 dB between 500 and 2500 Hz. By using a transformer hybrid like this model, the nominal transmission loss through the digital local exchange would be 6 dB.

Summarizing the survey one can state that for the Austrian telephone network the transmission loss of 7 dB per digital local exchange gives an OLL of 22 dB between 300 and 3400 Hz, and 30 dB between 500 and 2500 Hz. Considering the OLL recommended by the CCITT, the transmission loss could even be reduced to 4 dB in most cases to overcome attenuation problems due to long trunks.

The paper by Mr K. Mirski and Mrs M. Pashova (Bulgaria) on *Drawing up a plan of the signal levels during the transition period from analogue to digital networks* could not be presented at the seminar in the absence of the authors. The paper focuses on the various requirements on the transmission characteristics: to provide the stability of the established connections; not to allow objectionable echo; the difference in the values of the transmission loss in both directions must not exceed the admissible values. If the target is to have a quite high stability, a rational distribution of the signal levels is to be made, taking into consideration the real capabilities of the technical facilities and other factors. The paper then deals with the solution of the above problems in Bulgaria.

The paper by Dr H. Murakami (Japan) seemed to attract wide interest among the participants. The paper on *A loss design method of a connection with multiple 4-wire loops* in its introduction reviewed the problem of a connection containing several 4-wire and 2-wire links or equipment. A 2-wire/4-wire converter is used to connect a 2-wire transmission line and a 4-wire transmission line. There are two types of 2-wire/4-wire converters. One is a conventional type, which is composed of a hybrid coil. The other is a new type, which is composed of an active hybrid. An active hybrid is composed of two operational amplifiers and three impedances.

The author discussed the required conditions for limiting the quality degradation due to singing, listener echo, talker echo and sidetone.

In transmission loss (attenuation distortion) characteristics caused by 4-wire loops and the number of peaks is inversely proportional to delay time of each loop. The maximum value of attenuation distortion in the connection can be the voltage sum of peak value of each loop. In round trip delays of about 3 ms the number of peaks in attenuation distortion caused by each loop is small. When the connection includes a trunk line, a round trip delay is larger than 20 ms and most peak values of attenuation distortion in that connection are nearly equal to the voltage sum.

In a local connection including two D-PBX, the signal to listener echo power ratio (SER) is computed under the condition that transmission characteristics of two D-PBX are assumed to be similar.[2-4]

4. Loudness rating

Reference equivalents, corrected reference equivalents and loudness ratings: a historical account was read by Mr J. Lalou (France) going in turn through the main steps of development on loudness, beginning with the SFERT (1928), followed by the ARAEN and NOSFER (till 1984) and underlining their drawbacks from the point of view of network planning (strong level dependability, non-additivity, large spread in test reproducibility, etc.). The author gave a short description of the corrected reference equivalent and the R.25 equivalents, and finally about the loudness rating, saying that all these were recommended in the last two study periods of the CCITT. However none of them were without drawbacks. Lately several methods were proposed to determine LRs, either by objective measurement of frequency characteristics (Recommendation P.64) and subsequent calculation (Recommendation P.79) or by direct measurement with suitable instrumentations (see Recommendation P.65 and CCITT Handbook on telephonometry). In the opinion of the author, the loudness would not be so important a factor in a completely digital network as it is now, however, the most pressing problem at present is that of networks which are partly digital, partly analogue.

Loudness rating as a tool in transmission planning was the title of the next lecture given by Mr N. O. Johannesson (Sweden) dealing at first with the basic idea of this very important parameter. It is—in CCITT context—an objective measure of the "loudness loss", i.e. a weighted electro-acoustic loss between certain interfaces in a telephone connection. If the circuit between two subscribers is subdivided—for planning purpose—into sections, the sum of the individual section loudness ratings (LRs) is

equal to the total or overall loudness rating (OLR). The sidetone and the echo phenomena, at the talker and at the listener, may as well be LR parameters. Then a psycho-acoustic model for LR (how the brain interprets loudness impressions) was explained by figures and formulas (by the CCITT recommended algorithm). With these, the not very critical character of the weighting due to the frequency transmission characteristics of a section was clarified. The special measuring instruments conforming to the CCITT Recommendations (e.g. Recommendation P.65) to determine the LRs of analogue telephone set objectively, together with some precautions recommended at using the test results, have also been explained. The national transmission plan must be based on a general LR specification for approved telephone sets. Recommendation G.121 contains the "nominal" send and receive loudness ratings, which mean the arithmetic average of the specified minimum and maximum values.

The author underlined the importance of having consistent rules in transmission planning: i.e.—without striving for illusive high precision—the OLR is the algebraic sum of the send and receive LRs of the sets plus the circuit LRs of the individual sections between them (the latter are simply the composite losses at the reference frequency 1020 Hz). It is interesting to note that an OLR = 9 dB value—which is well within the optimum range—corresponds to about 0 dB acoustic loss from the speaker's mouth to the listener's ear.

Telephone network loudness aspects was the title of Mrs M. Z. Petrova's paper (USSR), in which she took into account all the factors directly or indirectly affecting the loudness of the received telephone speech.

The planning aspects and values have been expressed by CREs taking into account factors, such as additivity, attenuation distortion, impedance mismatch, electrical noise, room noise and sidetone. The author gave a methodology to determine the mean ORE (overall reference equivalent) values and the determination of the mean OCRE (overall corrected reference equivalent) values for local and long-distance connections.

The electrical noise effect on the received speech loudness was studied in the USSR on high-quality path, fully meeting the NOSFER system. Four reference equivalent (RE) levels and three types of noise (white, Hoth spectrum and linear exchange noises) were used.

The room noise effect was also analysed with the result that there was a close correlation between the Hoth spectrum noise and the weighted circuit noise in term of their effect on transmission quality.

5. Quality requirements

Arrangement, objectives and measurement of mixed analogue-digital circuits and lines was the title of the paper presented by Mr V. Moskvitin (USSR) dealing with the transition period from fully analogue to fully digital network. In this period, networks will have mixed audio-frequency channels and links. At the conjunction points of the sections one could use various types of analogue-digital and digital-analogue conversions. One of the important considerations during the transition period is the quality control of the network. These questions are being studied by the CCITT.

There are a number of parameters in digital transmission systems which are not standardized in analogue systems, namely spurious out-of-band signals at the channel's output and spurious in-band signals at the channel's output. The quality control of a mixed analogue-digital 4-wire chain needs some new addition laws and measuring methods.

Studies concerning transmission quality in CCITT Working Party XII/3 was the title of a report given by Mr R. W. Hatch (United States), Chairman of Working Party XII/3. The author discussed the main results on loudness loss, attenuation distortion, circuit noise and cross-talk. Special emphasis was laid on the talker and listener echo. A most interesting part of the paper dealt with opinion models.

Opinion models for the effect of transmission impairments provide a convenient way to summarize the results from objective tests and are in use in several administrations. Such models can be based on the combined results from several tests and include a number of impairments. The study of opinion models lists 10 degrading factors which should be taken into account, namely transmission loss, circuit noise, room noise, attenuation distortion, sidetone, non-linear distortion, echo, propagation time, delay distortion, and voice switching effects. Clearly, this question is closely related to many of the other questions but has the specific purpose of studying models now in use by administrations, the ability of these models to predict "conversation test" results, the agreement between models, and finally, whether a single model can be recommended for international use. However, it appears highly unlikely that a single model can be agreed upon in the near future.

Transmission performance and planning was read by Mr Lalou. The paper resulted from discussions with Mrs S. Amara (France), who had originally been asked to deal with the subject. In this paper, the transmission objectives of the French telephone network were presented. For the subscriber systems with an artificial line (representing 3.5 km of 0.4 mm conductors) values for RE and LR were quoted.

These values correspond to the long-term CCITT objective for reception and the short-term objective for sending (however, the values recommended by the CCITT apply to traffic-weighted means).

6. Examples of planning

Economic considerations in network planning, a paper, written by Mr M. W. Thayer (United States), dealt with such

kinds of planning aspects which normally were not considered: the business views of the telecommunications and a truly optimum plan for the administrations.

The chaining of the individually optimum separate investment plans, e.g. those of switching, transmission, etc., will surely result in a decidedly sub-optimum plan. A plan which considers all of the relevant aspects of the business would be the only way to develop an overall economic optimum. For instance, the planner must not ignore non-technical factors such as the tariff strategy (traffic during the day); he should put the already existing (earlier invested) part of the facilities and equipment into productive use so as to generate revenue. Further, the planner must not misuse such kind of ratio as cost per switch ports (because the primary costs of a switch is composed of the central processor and software but adding input and output ports is a fairly low cost operation), and cost per kilometre for a transmission system (because it has variable terminal and variable distance costs), since these could lead to completely erroneous conclusions.

The costs (investment and operation ones) as well as the prices or pricing policy are quite complex subjects, which were next treated in detail. Many planning studies have shown that one of the highest costs in the network is converting the analogue voice signal to a digital format and vice versa. These costs can however easily vary by a factor of ten, depending on the specific hardware used. In investment accountings one must be very careful, e.g. to make certain that the investment costs in the books contain the same components that the planner expects and needs, and the same thing could be said for the labour required to install the equipment. The accounting, at both examples mentioned, might spread the cost of transportation and the total labour costs based on the value of each item rather than the actual costs. Another question is the utilization percentage of the materials invested. Many illustrative examples have been given to show that vigorous efforts may be warranted to drive utilization to at least the 50% level.

Essentials of a modern transmission plan for transition to digitalization was the title of Mr Pyddoke's second paper beginning with a short reference to the objectives (or purposes) of any new network planning and citing CCITT's considerations about the planning implementations.

Detailed explanations were given by the author concerning the echo and the limits of delay. Finally, a short review on the setting-up of traffic completed the lecture, together with guidance to the maintenance activities.

7. Case studies

Major steps along a road from an analogue to a digital telecommunication infrastructure in the Federal Republic of Germany—expansion of the transmission network. This paper of Mr N. Gawron (Federal Republic of Germany) reports the development strategy and medium-term plan of the *Deutsche Bundespost*, citing the main goal, which is to go from the now predominantly analogue infrastructure to an all-digital infrastructure with integrated network in optical fibre.

This plan, beginning with the digitized telephone network, is going to realize its final strategic objective, the "integrated broadband telecommunication network" (IBTN). This is an ISDN-B, involving also the television and sound distribution services on the subscriber lines (and very probably also the packet switched data communication), and will be available in approximately eight years from now.[5-7]

The second case study was presented by Mr W. T. Jones (Alcatel, UK) with the title *Transmission planning aspects of digitalized networks: Considerations arising from the ITT-sponsored ITU pilot projects for World Communications Year 1983.* As its contribution to World Communication Year 1983, ITT undertook several pilot projects, all involved in one way or another, with the digitization of networks. Each addressed the overall network planning aspects of telecommunications development, i.e. the methodology for minimizing the necessary investments and dimensioning the equipment etc. requirements, all in conformity with established performance objectives.

The author reviewed the development of transmission loss design from 1934 to 1984.

ITT-Alcatel developed for rural areas a computer-aided network planning method. The programme enables a planner to make a well informed judgement as to the most useful combination of transmission plan parameters and extent of service area which can be adopted, taking into account specific cost limitations.

Mr M. Cartier (France) reported a case study about the *speech processing systems* used for land mobile services. It is quite an important objective to reduce the transmission band, but at the same time 16 or 32 kbit/s must have a quality which does not impair the overall performance of the public switched telephone network (PSTN). The speaker found that the best results could be achieved by linear predicting methods. The study gave some examples of solutions resulting in fairly good performances.

8. Round table discussions

Complexities of combined effects of transmission impairments and their assessment was the task of an *ad hoc* panel, the discussion of which was reported by Mr A. Ganguli (CCITT Secretariat) as below. The highlights of the discussion were as follows:

- different computer "models", predicting the transmission quality under the combined effect of various impairments, already exist with different administrations (e.g. France, United Kingdom (British Telecom), United States (American Telephone and Telegraph Company—AT&T), Japan (*Nippon Telegraph and Telephone Corporation*—NTT), etc.);

- these models differ from each other in assessment principle and scale, e.g. MOS, information index, etc. In these models, interaction of different impairments is taken into account;
- each of these models is adequate only to a certain extent and is not comprehensive enough to accommodate all possible impairments, e.g. echo, absolute delay, etc.;
- speech quality of a transmission chain can be correctly assessed only through subjective data and perhaps we should compare in details the results from different models and design our subjective tests with only those impairments not common to all of them;
- subjective evaluation is time consuming and variable even in a controlled group;
- new assessments of impairments could not be introduced in a model, even with limited confidence, without any subjective data;
- time-variant parameter (associated with e.g. packetized transmission) could not be easily included in a model. Such impairment, perhaps, could be equated to the nearest available parameter, e.g. quantizing distortion or "clipping" in terms of loss of information;
- simulation of impairments in a structured language through grammatical or semantical distortions will not have expected effect on speech quality. Such semantic constraints were shown in the past to create redundancy so far as intelligibility is concerned;
- for assessment of digital systems, good objective methods are available e.g. cepstral distance (NTT), maximum-likelihood ratio, etc.;
- the model "information index" (France), basically for digital transmission, is within the framework of general information theory and can be applied to analogue systems as well. In principle, this and the British Telecom model are improvements of the old "articulation index" method;
- the AT&T model is derived from subjective MOS, a regression line being anchored to two points which correspond to two well-defined sets of physical conditions;
- the NTT model adds up certain quantities which characterize various impairments;
- perhaps subjective testing could not be omitted for good for two reasons: to refresh the subjective data bank to reflect the increasing expectation of the population, and to take into account the new devices and techniques which introduce new types of impairments.

Another *ad hoc* panel discussed the influence of *network planning on reliability and availability.* The participants felt it to be necessary to work further on reliability and availability allocation plan and to develop some planning rules for subdivision of the allowed reliability and availability impairments.

The members of the third panel discussed *economic questions* and statements were made in the following directions:

- there is a minimum size of development stage, i.e. to add new facilities;
- telecommunication development requires well defined financial resources. When posts and telecommunications have a common budget, sharing the resources may be difficult;
- for increasing the income it is important to improve reliability and availability.

The fourth *ad hoc* panel clarified some problems regarding the *use of loudness rating.* The paper of Mr Johannesson and the new Recommendations G.111 and G.121 were the basis of the discussion.

9. Summary

A number of planning aspects of transmission quality were discussed at the seminar with stress on the most important points. The participants were able to gain a lot of new information, while the lecturers had an opportunity to exchange their views on the topic.– *A. Lajkó and G. Lajtha.*

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Calendar of non-ITU scientific and technical meetings

date	place	title and organizer	further information from
1988			
7-11 February	Riyadh	SaudiCom 88—2nd Electronic Communications Show *Ministry of Posts, Telegraphs and Telephones, Saudi Arabia*	SaudiCom 88 Overseas Exhibition Services Ltd 11 Manchester Square London W1M 5AB (United Kingdom) Tel.: 44 1 486 1951 Telex: 24591 MONTEX G
11-13 February	New Delhi	10th General Assembly of the Asia Electronics Union (AEU) and Symposium on Regional Co-operation in Electronics and Telecommunications—Industries and Technology *Asia Electronics Union and Department of Electronics, Government of India*	Dr. R. P. Wadhwa Department of Electronics Lok Nayak Bhavan, Khan Market New Delhi 110003 (India) Tel.: 011 619858 India Telex: 31 66536 DOE IN Mr K. Isogai Secretary General Asia Electronics Union Room 704 Uchisaiwai Building 2-4 Uchisaiwai-cho 1-chome Chiyoda-ku Tokyo 100 (Japan) Tel.: 03-591-7161 Telex: J 33587 ASIELECU
15-19 February	Honolulu	10th Annual Pacific Telecommunications Conference (PTC '88)—Telecommunications and Pacific development: alternatives for the next decade *Pacific Telecommunications Council*	Pacific Telecommunications Council 1110 University Avenue Suite 308 Honolulu, HI 96826 (United States) Tel.: (808) 941-3789 Telex: 7430550 PTC
28 February-2 March	New Orleans	IEEE 1988 Network Operations and Management Symposium (NOMS '88) *Institute of Electrical and Electronics Engineers, Inc. (IEEE)*	IEEE Communications Society 345 East 47th Street New York, NY 10017 (United States)

date	place	title and organizer	further information from
13-17 March	Arlington (United States)	Twelfth International Communication Satellite Systems Conference *The American Institute of Aeronautics and Astronautics (AIAA)*	Dr. Denis J. Curtin Communications Satellite Corporation 22300 Comsat Drive Clarksburg, MD 20871 (United States) Tel.: (301) 428-4474
16-23 March	Hanover	CeBIT 88 Hanover Fair	Deutsche Messe- und Ausstellungs AG Messegelände D-3000 Hannover 82 (Fed. Rep. of Germany) Tel.: (511) 89-1 Telex: 922728
8-12 April	Las Vegas	42nd Annual Broadcast Engineering Conference *National Association of Broadcasters*	National Association of Broadcasters 1771 N Street NW Washington, DC 20036 (United States) Tel.: (202) 429-5419 Telex: 350085
10-13 April	Washington	8th IC&C Executive Forum—International Computers and Communications 1988-2000 *International Computers and Communications*	IC&C PO Box 17392 Washington, DC 20041 (United States) Tel.: (703) 476-2604 Telefax: (703) 860-8985
11-13 April	London	4th International Conference on HF Radio Systems and Techniques *Institution of Electrical Engineers (IEE)*	Conference Services IEE Savoy Place London WC2R 0BL (United Kingdom) Tel.: (01) 240 1871 Ext. 222
18-21 April	St. Louis (United States)	ISDN/88—Fourth International Integrated Services Digital Networks Exposition *Information Gatekeepers, Inc.*	Information Gatekeepers, Inc. 214 Harvard Avenue Boston, MA 02134 (United States) Tel.: (617) 232-3111 Telex: 499-6088 FIBER
25-29 April	Strasbourg	Europe in Space—the Manned Space System *European Space Agency (ESA) et al.*	SOCFI 14, rue Mandar F-75002 Paris (France)
26-28 April	London	Fibre Optics '88—Sixth International Conference and Exhibition on Fibre Optics and Opto-electronics	Conference Office Sira Ltd, South Hill Chislehurst, Kent BR7 5EH (United Kingdom) Tel. (01) 467 2636 Telex: 896649

date	place	title and organizer	further information from
17-20 May	Madrid	EUROTELECOM/MADRID 88—II Conference and Exhibition of European Telecommunications *Ministry of Transport, Tourism and Communications et al.*	EUROTELECOM/MADRID 88 Beatriz de Bobadilla 3 planta 9 E-28040 Madrid (Spain) Tel.: +34 1 233 02 89 Telex: 46032 ETM E Telefax: +34 1 234 79 72
17-22 May	Nanjing	TELECOM CHINA '88—International Exhibition on Post and Telecommunication Equipment and Materials *Jiangsu Bureau of Post and Telecommunication Administration et al.*	Mr Zhang Zhong Ming Jiangsu International Exhibition Co. The First Business Department 518 Zhong Shan Road East Nanjing (China) Tel.: 49076 Telex: 34015 INTEX CN
24-27 May	The Hague	12th International Symposium on Human Factors in Telecommunication *Netherlands Postal and Telecommunications Service, AT&T and Philips Telecommunications BV et al.*	Leon van Noorden HFT '88 PO Box 30088 NL-2500 GB The Hague (Netherlands) Tel.: +31 70 43 31 46
8-11 June	Singapore	InfotechAsia 88 *Singapore Exhibition Services Ltd*	Vivienne Caisey Overseas Exhibition Services Ltd 11 Manchester Square London W1M 5AB (United Kingdom) Tel.: 44 1 486 1951 Telex: 24591 MONTEX G
14-18 June	Oslo	NOR-COM '88—International Telecommunication Exhibition and Conference *Norwegian Trade Fair Foundation*	Norwegian Trade Fair Foundation PO Box 130 Skøyen N-0212 Oslo 2 (Norway) Tel.: (02) 43 80 80 Telex: 78748 MESSE N Telefax: (02) 43 19 14
26-30 June	Amsterdam	EFOC/LAN 88—Sixth International Fibre Optic Communications and Local Area Networks Exposition *Information Gatekeepers, Inc.*	Information Gatekeepers, Inc. 214 Harvard Avenue Boston, MA 02134 (United States) Tel.: (617) 232-3111 Telex: 499-6088 FIBER
28-30 June	Wroclaw	9th International Wroclaw Symposium on Electromagnetic Compatibility *The Association of Polish Electrical Engineers*	EMC Symposium PO Box 2141 51-645 Wroclaw 12 (Poland) Telex: 712118 ILW PL

date	place	title and organizer	further information from
20-27 July	Otaniemi (Finland)	COSPAR SPACE 88 *COSPAR (Committee on Space Research)*	COSPAR SPACE 88 c/o Congress Service Leena Aarrejärvi PO Box 854 SF-00101 Helsinki (Finland) Tel.: (0) 6949822 Telex: 125961 AAROY SF
29 August- 2 September	Budapest	RELECTRONIC '88—7th Symposium on Reliability in Electronics *Department of Technical Science of the Hungarian Academy of Sciences*	Scientific Society for Telecommunication PO Box 451 H-1372 Budapest (Hungary) Tel.: 531-027 Telex: 22-5792 MTESZ HTE
6-11 September	New Delhi	"Electronics India '88" Exhibition *Trade Fair Authority of India*	General Manager Trade Fair Authority of India Pragati, Maidan New Delhi (India) Telex: 031-61022/031-61311 COMX IN
20-22 September	Loughborough	International Conference on Digital Processing of Signals in Communications *Institution of Electronic and Radio Engineers*	The IERE Conference Secretariat Savoy Hill House Savoy Hill London WC2R 0JD (United Kingdom) Tel.: (01) 240 1871
23-27 September	Brighton	12th International Broadcasting Convention—IBC 1988 *International Association of Broadcasting Manufacturers et al.*	IBC Secretariat Institution of Electrical Engineers Savoy Place London WC2R 0BL (United Kingdom) Tel.: (01) 240 1871 Telex: 261176 IEE LDN G
27-28 September	Paris	Domestic and Regional Communications Satellite Systems—Operators and Users Symposium *Satel Conseil*	Satel Conseil Claude Gourdet 5, rue Louis Lejeune F-92128 Montrouge (France) Tel.: 46 57 13 30 Telex: 20422 F
2-6 November	Istanbul	Communications Turkey 88	Overseas Exhibition Services Ltd 11 Manchester Square London W1M 5AB (United Kingdom) Tel.: (01) 486 1951 Telex: 24591 MONTEX G Telefax: (01) 935 8625

Americas TELECOM 88

Rio de Janeiro - Brasil
Riocentro 16-21 May 1988

THE JOURNAL

One hundred years ago

Telegraphs and Telephones in Germany, 1886[1]).

(Extract from the statistics of the Postal and Telegraph Department of the German Empire for 1886.)

At 31 December 1886, the German Administration's network of telegraph lines comprised:

Overhead lines (including cable lines in towns, through tunnels, over rivers and lakes but excluding those of urban telephone networks)	kilom.	69 029
Underground lines	"	5 619
Submarine cables	"	42
Total length of lines	kilom.	74 690

The cables connecting Imperial territory to Norway, England and Ireland, which cover a total distance of 2966 kilometres but belong to different private companies, should also be regarded as forming an integral part of the German network.

The length of conductors in the different parts of the line network is broken down as follows:

Overhead lines	kilom.	223 269
Underground lines	"	37 956
Submarine cables	"	126
Total length of wires	kilom.	261 351

The total number of telegraph offices at the same date was	12 682
including:	
State-owned offices (including 623 sub-offices)	8 841
Railways stations opened the private telegram service	3 464
Privately-owned offices	377
Total	12 682

. . . . .

The number of telegraph offices served by telephones stood at 3 702

. . . . .

Equipments in service amounted to 16 596, including:

9554 Morse equipments
221 Hughes "
6505 telephones
316 miscellaneous equipments.

. . . . .

Telegram traffic was as follows:

Inlands telegrams	11 972 679
Telegrams to foreign countries	2 844 982
" from foreign countries	3 082 643
" in transit via Germany	759 402
Grand total	18 659 706

. . . . .

News.

Fast equipment. – The Italian Administration replaced the Hughes equipment by automatic Wheatstone equipment between Rome and Palermo on 1 October and between Naples and Palermo on 18 October last.

We also learn that since last December Baudot equipment has been used for the service over the Paris to Rome line.

Journal télégraphique – February 1888

[1]) These figures relate to the Imperial Postal and Telegraph Administration but do not include Bavaria or Württemberg which have special Administrations for both public services.

SPECIAL SESSION OF THE WORLD TELECOMMUNICATION FORUM AND SPECIALIZED INTERNATIONAL TELECOMMUNICATION EXHIBITION

Rio de Janeiro – Brazil (Riocentro) 16-21 May 1988

Organized by the Ministry of Communications of Brazil in cooperation with the International Telecommunication Union

ITU Telecommunication Policy Symposium (16-18 May 1988). ***Future of Telecommunications and Their Role in Society.*** Review of trends in telecommunications services regulation and their consequences; interaction of economic goals and communications requirements; need for adequate investment in telecommunications and its role as a tool for future growth.

Special Session of the World Telecommunication Forum (18-21 May 1988). ***Shaping the Integrated Future: Evolution and Reality of ISDN and Cellular Radio.*** International speakers will share their views, experiences and plans for the future on the extension of basic systems through ISDN and the use of cellular radio to provide services for regions difficult to access.

International Telecommunication Exhibition (16-21 May 1988). The range of products on display will include: systems and equipment for public and private terrestrial and space telecommunication services, radio communications, mobile telephones, data communications, ISDN.

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Note from the CCIR

Basic indices for ionospheric propagation

The following values of basic indices are published by the Specialized Secretariat of the CCIR in accordance with Resolution 4-3 and Recommendation 371-5 of the XVIth Plenary Assembly of the CCIR (Dubrovnik, 1986). The values are based on data kindly supplied by Dr. A. Koeckelenbergh, Sunspot Index Data Centre (Brussels), the National Research Council (Ottawa) and the Rutherford Appleton Laboratory (Chilton, Didcot, United Kingdom).

In order to expedite the dissemination of the indices, the CCIR Secretariat prepares a monthly circular which is dispatched around the middle of each month. Copies of these circulars may be obtained free of charge, from the Director of CCIR, ITU, Place des Nations, CH-1211 Genève 20 (Switzerland).

year	month	R_i	R_{12}	Φ	Φ_{12}	IG	IG_{12}	month	year
	January	2.5	14	73.2	74	4	8	January	
	February	23.2	13	83.6	73	13	8	February	
	March	15.1	13	77.0	73	18	8	March	
	April	18.5	14	75.1	74	17	8	April	
	May	13.7	15	72.6	74	10	9	May	
	June	1.1	14	67.6	74	3	9	June	
1986	July	18.1	14	70.2	74	7	9	July	1986
	August	7.4	13	68.4	73	5	8	August	
	September	3.8	12	68.7	73	8	8	September	
	October	35.4	13	83.0	74	11	8	October	
	November	15.2	16	77.2	75	10	8	November	
	December	6.8	16	72.6	76	0	10	December	
	January	10.4	17	72.6	77	−2	11	January	
	February	2.4	19	71.8	79	11	12	February	
	March	14.7	23	74.0	80	10	14	March	
	April	39.3	25	84.9	82	22	15	April	
	May	30.6	27	87.8	84	23	16	May	
	June	17.5	29	77.8	85	19	19	June	
1987	July	33.0	***30***	84.6	***90***	13	***21***	July	1987
	August	38.6	***31***	90.0	***92***	31	***24***	August	
	September	33.5	***32***	86.1	***93***	24	***27***	September	
	October	61.1	***34***	98.6	***93***	28	***29***	October	
	November	40.9	***35***	101.2	***92***	29	***32***	November	
	December	26.5	***36±7***	94.1	***100***	27	***35***	December	
	January		***34***		***109***		***40***	January	
	February		***35***		***115***		***44***	February	
	March		***36***		***119***		***48***	March	
	April		***37***		***118***		***52***	April	
	May		***37***		***118***		***57***	May	
	June		***38±8***		***113***		***63***	June	
1988	July		***39***		***114***		***68***	July	1988
	August		***40***		***112***		***73***	August	
	September		***41***		***111***		***78***	September	
	October		***41***		***116***		***84***	October	
	November		***42***		***123***		***91***	November	
	December		***43±14***		***119***		***96***	December	

Measured values are printed in roman type: predicted values in bold italic type.

R_i : monthly mean international relative sunspot number

R_{12} : twelve month running mean of R_1

Φ : monthly mean value of solar noise flux at 2800 MHz at 17h00 UTC measured at Ottawa

Φ_{12} : twelve month running mean of Φ

IG : ionospherically derived solar activity index

IG_{12} : twelve month running mean of IG

Characteristics of non-ionized media and radio-wave propagation in equatorial areas—A Review

by J. O. OYINLOYE

ABSTRACT

Characteristics of the non-ionized media in relation to radio propagation near the equator are reviewed. Topics covered include effective ground conductivity, radio refractivity, rain and atmospheric gas attenuation in the troposphere. Important areas of need for future research are identified.

1. Introduction

THIS article examines media characteristics and radio propagation near the equator. The objectives are:

- to expose our present knowledge of the special features of the equatorial radio environment and hence radio propagation conditions in this region;
- to identify areas of need for future research for radio propagation in the region.

The morphology of the non-ionized media is considered in this article in relation to ground- and tropospheric radio-wave propagation. The troposphere near the equator is characterized by:

a) relatively little variation in surface temperature throughout the year with a range within about 10°C in extreme cases and, quite often, within about 5°C at a given location;

b) most intense rainfall in the climatic regions of the world. The rainfall rate, R (mmh^{-1}), exceeded 0.01% of the time is more than double those found in temperate regions. Consequently, attenuation of microwave radio propagation due to rainfall is highest in the equatorial region;

c) the harmattan period in West Africa, which falls typically between November and February, is characterized by dust particles from the Sahara carried by a north-easterly wind and it coincides with a season of minimum or no rain. The period seems to favour relatively lower values of surface refractivity than other seasons of the year and supports trans-horizon propagation;

d) the monsoon period in India, which falls typically between June and October, is characterized by heavy rainfall brought about by a south-westerly wind carrying moisture from the sea on to the subcontinent. The period is associated with relatively high values of surface refractivity.

2. Ground-wave propagation

Ground-waves are propagated close to the earth's surface and therefore suffer varying amounts of attenuation according to its nature–surface irregularities, electric relative permittivity ε and conductivity σ. For design purposes, a real surface is replaced by an equivalent surface having electric characteristics (ε, σ) which will produce the same amount of attenuation in a specified band of frequencies as the actual one.

The complex relative permittivity for this mode of propagation is given by:

$$\varepsilon^1 = \varepsilon - j\,60\,\sigma\lambda \qquad (1)$$

where λ (in metres) is the free space wavelength of the propagating wave, σ is in mmho/m and the time factor exponent (*jwt*) is assumed. For example, at medium wave broadcast frequencies and for a typical value of ε = 4, the effect of conductivity is predominant.

Ajayi and Owolabi [9] have made preliminary measurements of effective ground conductivity on 656 kHz for areas covering about 80 km radial distance from Ibadan (7.4° N, 3.9° E) in Nigeria using the radio-wave attenuation technique. This method is based on the attenuation of surface waves due to finite conductivity of the earth. Field strength E is computed for various distances D using various values of conductivity and permittivity. Measured field strength E along different radial axes is then compared with computed E for a family of field strength-distance or *E-D* curves and the appropriate values of σ are those giving the best fit of measured E to the theoretical curves. For the experiment conducted by Ajayi and Owolabi [9], 15 radial axes were drawn from the transmitter site and field-strength measurements were made during the period June-September 1974. The values of conductivity obtained by them varied from 1 to 4 mmho/m as shown in the map of figure 1, their values of conductivity are essentially independent of values of relative permittivity ε from 4 to 15.

3. Tropospheric propagation

3.1 Radio refractivity

3.1.1 General consideration

Propagation of radio waves in VHF, UHF and SHF bands are affected by meteorological conditions in the troposphere. The refractive index n depends on pressure P (millibars), temperature T (degrees absolute) and water vapour pressure e (millibars). The radio refractivity N for air for frequencies up to 100 GHz is given by:

$$N = (n-1) \times 10^{-6} = \frac{77.6}{T}\left(P + 4810\,\frac{e}{T}\right) \qquad (2)$$

$$N = 77.6\left(\frac{P}{T}\right) + 3.73 \times 10^5\,\frac{e}{T^2} \qquad (3)$$

is measured in $(n-1) \times 10^6$ or N units. The first and second terms of equation *(3)* represent respectively the "dry" and "wet" terms in the refractivity N.

The radio beam leaving the transmitter at the earth's surface describes a curved path. It is however common practice in the treatment of rays to adopt a hypothetical effective earth radius that makes the relative curvature of the ray and that of an effective Earth to be such that radio rays appear to travel in straight lines rather than as curved lines over the true Earth. The effective earth radius a' is related to the true earth radius a by the equation:

$$a' = Ka \qquad (4)$$

where

$$K = \left(1 + \frac{a\,dN}{dh}\right)^{-1} \qquad (5)$$

and K is known as the effective earth radius factor. With a standard value of –40 N units/km for the median of the refractivity gradient dN/dh for the first 1 km, the median value of K for the middle latitudes is 4/3. A great variability is observed in the median values of K near the equator. For example, median values of K in the range 1.3-1.8 have been observed in the equatorial region of India.[24] On the average, surface refractivity in the equatorial region is higher than in the middle latitudes.[13]

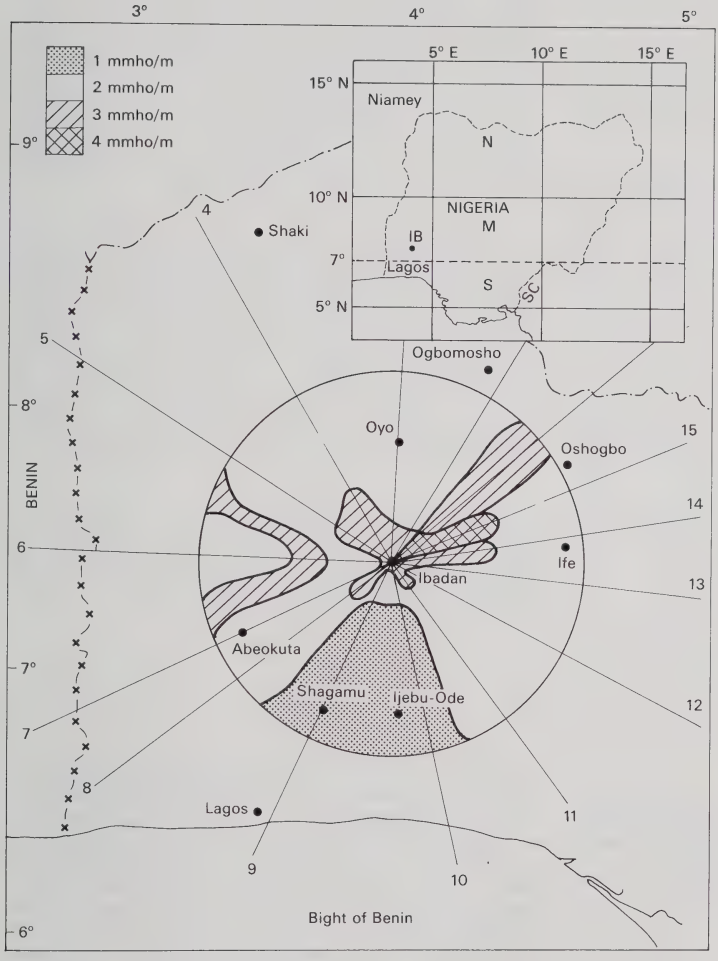


Figure 1—Ground conductivity map for South Western Nigeria (after Ajayi and Owolabi [9]). The inset shows the map of Nigeria with the positions of Lagos and Ibadan (IB) northern (N), middle (M) and southern (S) zones are referred to in figure 2. Notation SC refers to Southern Cameroon

3.1.2 Observed surface refractivity

Surface refractivity can be derived from surface meteorological parameters of pressure, temperature and water vapour pressure by the means of equation *(2)*.

Owolabi and Williams [31] have computed the monthly mean surface refractivity N_s for 30 stations in Nigeria and Southern Cameroon for the years 1959 and 1960. Their results are illustrated by figure 2. Surface refractivity showed little variability between 1959 and 1960. The seasonal variation depends on

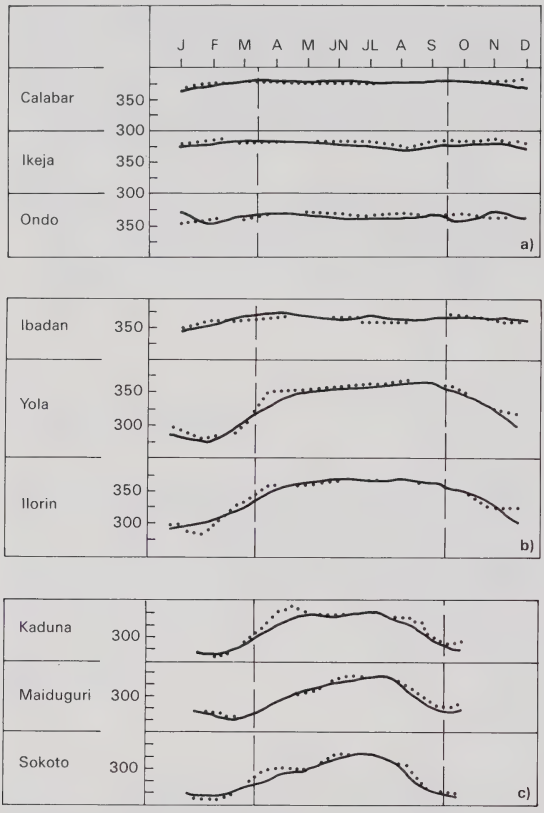


Figure 2—Patterns of surface refractivity, N */units in Nigeria for:* a) *southern zone,* b) *middle zone and* c) *northern zone (after Owolabi and Williams [31]). These zones are indicated in figure 1. Full lines are for 1960*

geographic latitude. In the southern coastal zone (latitudes 4-7° N), refractivity is virtually independent of season. In the middle zone (latitudes 7-10° N), surface refractivity has a fairly steady value during the rainy season of April to September, and on the average a higher value during this period than during the harmattan period of November to February. In the northern zone (latitudes 10-13° N), surface refractivity for the rainy season is also higher than for the harmattan period. The average values for the year decrease from South to North—these are 375, 350 and 325 *N* units for the southern, middle and northern zones, respectively. The main contribution to the variation comes from the "wet term" indicating that water vapour pressure is more variable than total atmospheric pressure. On the whole, the seasonal characteristic in surface refractivity is in agreement with the observed variation in radio field strength at VHF and UHF in Nigeria. More recently, Kolawole and Owonubi [21] have computed the sea level refractivity for 202 stations in Africa using the meteorological data for the period 1978-1979. Their results for the region between ± 20° geographic latitudes are in good agreement with those of Owolabi and Williams.[31]

In comparison, values of sea level refractivity at Belém (1.5°S, 48.5°N) in Brazil are about 370 and 360 *N* units in February and August respectively indicating slightly greater refractivity in local summer which coincides with the rainy season.[32] The variations of surface refractivity with latitude and seasons in India are illustrated by figure 3.[33] For latitudes below 20°, the inland values of 300-700 *N* units are in broad agreement with the results discussed above but in addition, there is a coastal effect characterized by the highest values of N_s in the range 360-400 *N* units. Refractivity is also higher in summer (March to May) and monsoon period (June to September).

It is seen that good agreement is found in the values and time variation of surface refractivity in the African, American and Asian sectors; coastal values are higher than inland values and show less seasonal variability, and in general values during rainy season are higher than at other seasons.

3.1.3 Superrefraction and ducting

Superrefraction and subrefraction occur when the refractivity gradient in the atmosphere is less and greater than the standard refractivity gradient of −40 *N* units/km respectively. If the vertical gradient of radio refractivity in a layer of the atmosphere is equal to −157 *N* units/km, the curvature of the path is equal to that of the Earth. On the few occasions when meteorological conditions are such that the vertical gradient is less than −157 *N* units/km, trapping or ducting of the rays may occur depending on the radio-wave length and duct thickness. A consequence of superrefraction and ducting is the extension of the radio range which sometimes leads to radio interference between neighbouring transmission links. On the other hand, subrefraction produces a greatly reduced radio horizon.

Occurrence of superrefraction and ducting has been found to be prevalent in the elevated atmospheric layers over the Atlantic Ocean, known as the trade wind inversion. This is

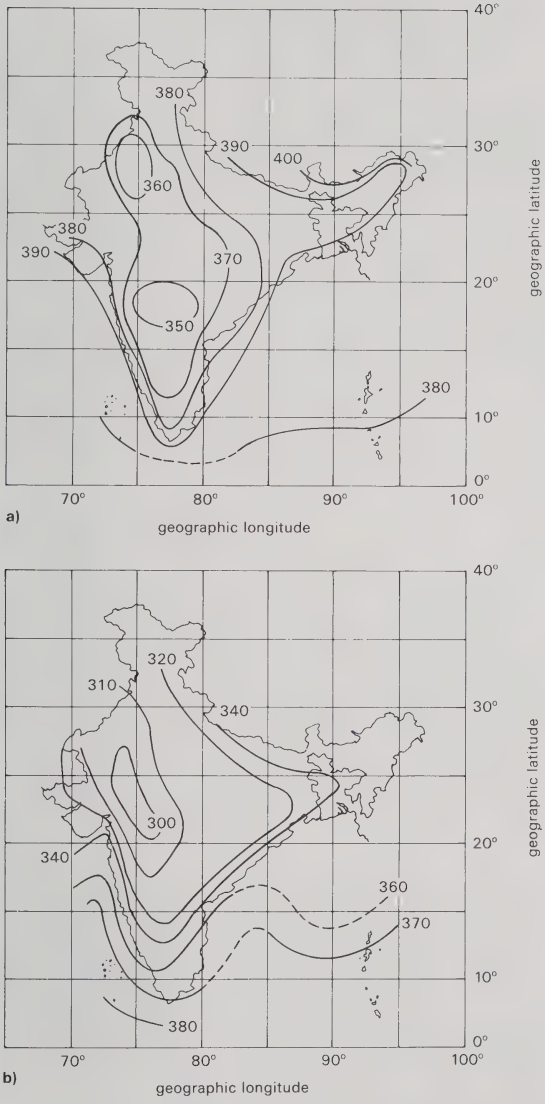


Figure 3—Contours of surface refractivity in India for a) *July and* b) *December at 03h00 GMT (after Reddy [33])*

more so in the eastern coastal areas where occurrence could be up to 90% of the time.[16] The trade wind inversion is the boundary between the warm dry air of the upper trade winds and the relatively cool, well mixed moist air of the surface winds, and the humidity and temperature gradients at this level produce large decreases in radio refractivity. By considering the data for the representative months of February, May, August and November, over a period of four to seven years (Dougherty *et al.*[16]) have found seasonal effect in the refractivity gradient. For example, at the eastern boundary of the Atlantic Ocean the mean refractivity gradient was about -190 *N* units/km as against about -100 *N* units/km in November and February. The contours of refractivity gradient for the month of May are shown in figure 4.

The surface duct occurrence probability for West Africa has been further studied by Owolabi and Ajayi [29] using the radio refractivity data for Dakar in Senegal (latitude 14.7° N), Niamey in Niger (latitude 13.5° N), Fort Lamy (N'Djamena)in Chad (latitude 12.1° N), Lagos in Nigeria (latitude 6.6° N), Abidjan in the Côte d'Ivoire (latitude 5.3° N) and Bangui in the Central African Republic (latitude 4.4° N). From a total of five years' data for the representative seasonal months of February, May, August and November, an average high surface ducting occurrence probability of 43% was found for the three stations north of latitude 12° N compared with the corresponding probability of 8% for the three stations south of latitude 12° N. The seasonal effect was also evident in the values of the occurrence probability for the stations north of latitude 12° N; there, the mean percentage probability for February and November was 48% as against 37% for May and August. On the contrary, the percentage probability for stations south of latitude 12° N did not show any seasonal effect.

In Senegal, which is on the Atlantic coast in West Africa, Hautefeuille *et al.* [19] have observed very deep fading of up to 50 dB on a 7 GHz Thiès-Kaolack-Ziguinchor radio link. The deep fading was present when the frequency was reduced to 2 GHz and the path length reduced from 60 to 30 km. The fading was associated with superrefracting and ducting conditions.

Surface duct occurrence probability contours for India, shown in figure 5 [33], indicate lower values than are found in the West African and Central African coastal areas. The values for Belém (Brazil) also vary between 9 and 26% with an annual mean of 16.3.[32]

3.2 Trans-horizon propagation

Ajayi [1] has obtained evidence of trans-horizon propagation between Lagos (geographic co-ordinates 6.6° N, 3.4° E) and Ile-Ife (geographic co-ordinates 7.5° N, 4.5° E) at the FM radio broadcasting frequency of 93 MHz of a 20 kW transmitter of the Federal Radio Corporation of Nigeria (FRCN). The transmitter path is about 165 km and Ile-Ife is not within the normal

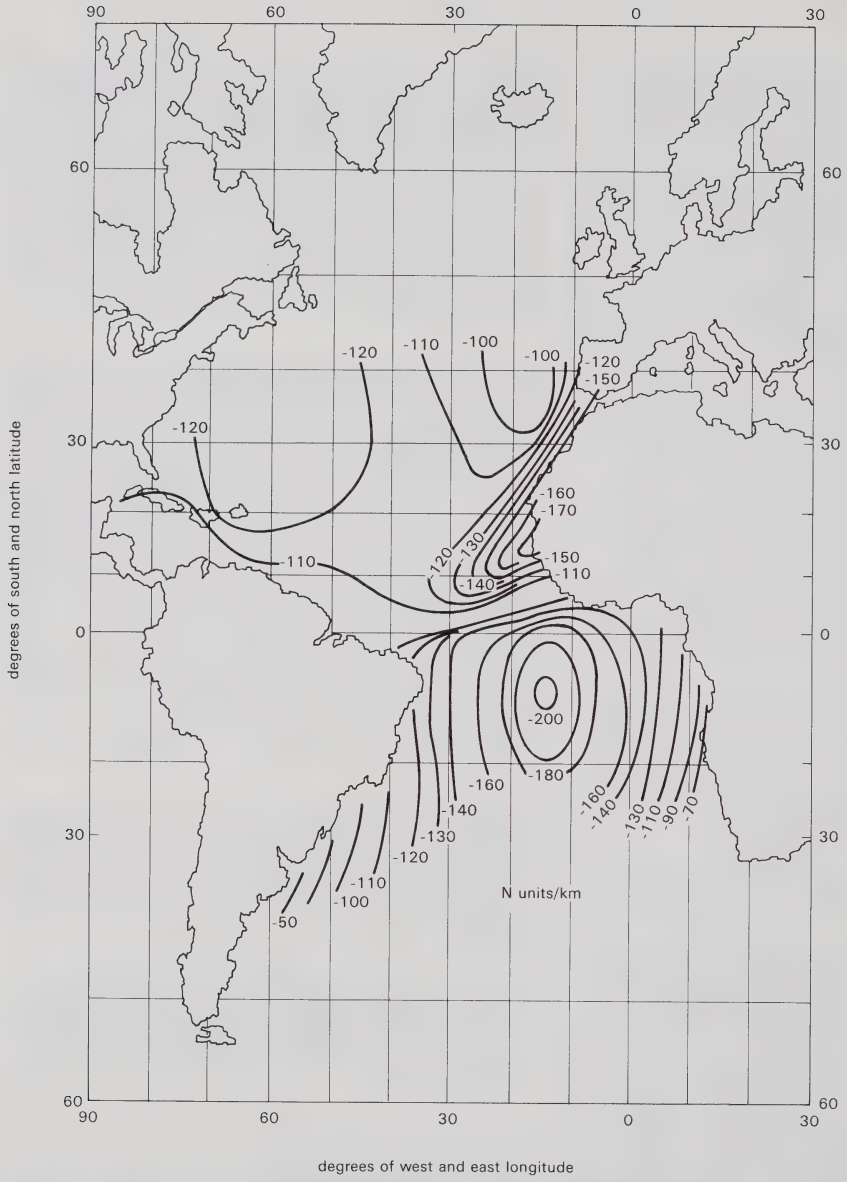


Figure 4—Refractivity gradient contours for the trade wind inversion in May (after Dougherty et al.[16])

coverage area (of about 80 km) of the FRCN transmitter under normal meteorological conditions in the lower troposphere. The measurements were made in 1979. It was found that:

a) the condition in the troposphere favouring trans-horizon propagation existed generally from about 18h00 until about 11h00 local time, corresponding to the time when the lower atmosphere is not thoroughly mixed as a result of radiation cooling which causes layer stratification;

b) median value of signal strength is lower during the rainy season than during the dry season especially during the foggy days of the harmattan period.

Noting that abnormal propagation at VHF due to ionospheric irregularities is limited to frequencies below about 90 MHz and takes place over much larger distances than 165 km, and noting further that the range of propagation by diffraction is only slightly greater than the line-of-sight distance, Ajayi [1] attributed the observed trans-horizon propagation to partial reflection and scattering in the lower troposphere.

3.3 Rainfall attenuation

Due to the crowding of Earth-satellite links in the 4/6 GHz band, it has become necessary to look for a higher frequency range of 10-20 GHz for use in terrestrial and space communication. Propagation at and above about 10 GHz could suffer serious attenuation due to rain absorption and scattering of the energy density of the incident electromagnetic wave by individual drops of rain. The magnitude of the attenuation depends on dropsize distribution of the rain and tends to increase with rainfall rate and wave frequency. Rainfall attenuation can be measured directly on an existing microwave link or it can be obtained indirectly from rain characteristics such as rainfall rate and dropsize distribution.

Direct measurement of rainfall attenuation on a 33.5 km, 7 GHz pan-African telecommunication network (PANAFTEL) link between Brazzaville (Congo) and Bangui (Central African Republic) has been reported by Moupfouma.[25] The measurement was for the period September 1980-April 1981. Attenuation exceeding 20 dB was observed 0.007, 0.036, 0.001 and 0.11% of the time in September, October, November and April, respectively. It was minimum in March when observed attenuation was less than 10 dB. In the Congo there are two main seasons—the rainy season from mid September to mid May with a short break in January and the dry season for the rest of the year. While the months of high attenuation fell within the rainy season, minimum attenuation observed in March was within the same season. Thus the period of high rainfall rate did not coincide on a one-to-one basis with the period of high attenuation. The fact that attenuation depends not only on rain rate but also drop size might explain this.

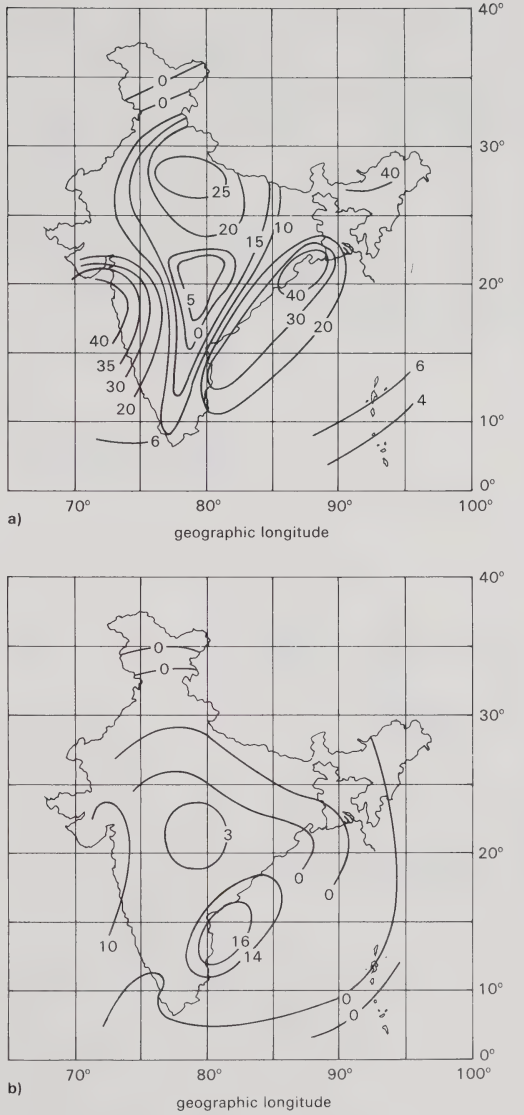


Figure 5—Surface duct occurrence probability (%) in India for a) *May and* b) *July at 00h00 GMT (after Reddy [33])*

Table 1

Values of parameters λ and s according to rain climatic zones

	rain climatic zones										
	D	E	F	G	H	J	K	L	M	N	P
λ	0.18	0.05	0.07	0.14	0.06	0.07	0.05	0.05	0.05	0.033	0.035
s	0.33	0.29	0.32	0.28	0.19	0.18	0.17	0.22	0.09	0.06	0.1

In terms of rain characteristics, the specific attenuation A dB/km is given by:

$$A = 4.343 \int_0^\infty Q_t(D)\, N(D)\, dD \qquad (6)$$

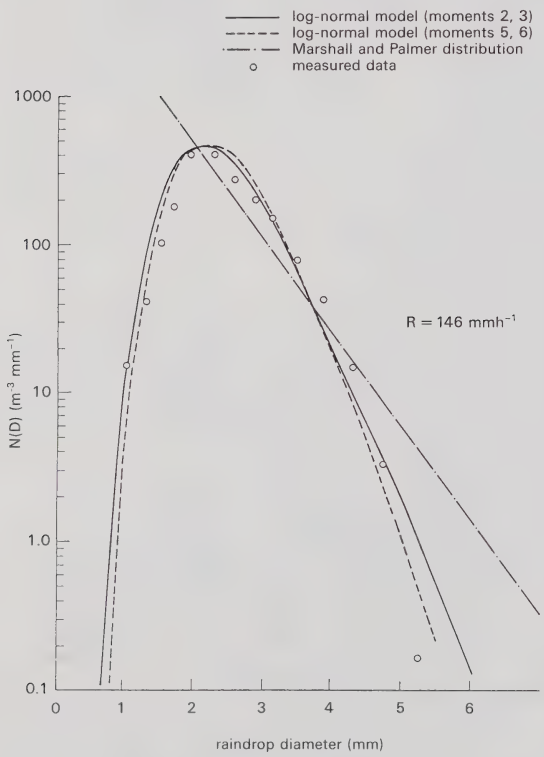


Figure 6—Comparison of Ajayi-Olsen raindrop size log-normal model with the Marshall and Palmer distribution (after Ajayi and Olsen [7])

$$Q_t(D) = Q_s(D) + Q_A(D) \qquad (7)$$

where Q_s and Q_A are scattering and absorption cross sections, respectively.

Q_t is a function of the dropsize diametre D, the wavelength of the radio wave λ and the complex refractive index m of the water drop and it can be calculated from the classical theory of Mie for a plane wave irradiating an absorbing sphere.[20] The raindrop size distribution $N(D)\,dD$ is on the other hand dependent on the rain rate R (mm/h). The relationship is given by:

$$R = 6\pi \times 10^{-4} \int_0^\infty D^3\, N(D)\; V(D)\; dD \qquad (8)$$

where $V(D)$ is the terminal velocity of the drops in ms^{-1} and $N(D)$ is in $mm^{-1}\,m^{-3}$. Thus a knowledge of the rain characteristic is required to predict rainfall attenuation.

From direct comparisons of measurements of rainfall attenuation on a terrestrial path with the rain rate measured on the path, it has been found that the specific attenuation can be represented approximately by the equation:

$$A = aR^b \qquad (9)$$

where a and b are parameters which depend on the frequency and polarization of the radio wave as well as the raindrop characteristics [28, 15, 18, 4] summaries of the values of the factors a and b have been given by Owolabi and Ajayi [30], Ajayi [4] and Ippolito [20].

The Laws and Parsons [22] raindrop size distribution is the most commonly used to calculate specific rainfall attenuation though the Marshall and Palmer [23] distribution (which is similar to that of Laws and Parsons) has been used by some workers. While these laws are appropriate for the middle latitudes, Ajayi and Olsen [7] have shown that these models do not adequately describe the raindrop size distribution in the equatorial region. From the measurements of raindrop size distri-

bution carried out at Ile-Ife using an impact type distrometer, it has been found that the log-normal distribution model in (figure 6) is more appropriate.[7, 8] The model is given by:

$$N(D) = \frac{N_T}{\sigma D\sqrt{2\pi}} \exp\left\{-\frac{1}{2}\left(\frac{\ln D - \mu}{\sigma}\right)^2\right\} \qquad (10)$$

$$\mu = -0.195 + 0.199 \ln R \qquad (11)$$

$$\sigma^2 = 0.137 - 0.013 \ln R \qquad (12)$$

where $N(D)$ is the number of drops per cc per unit diameter interval and D is the equivalent diameter (cm), μ is the mean of $\ln D$, σ is the standard deviation and N_T is the total number of drops of all sizes. The log-normal distribution fits dropsizes from the small diameter region to the large ones unlike the Laws and Parsons model which has difficulties with the small diameter region. This is significant realizing that in the equatorial and tropical regions, rain attenuation above 10 GHz is due mainly to small and medium drop sizes of about 1.0 to 4.0 mm.[27]

The high rainfall rate that is characteristic of the equatorial region is evident in figure 7, showing the cumulative distribution of rainfall rate for the equatorial stations of Darwin (Australia), Belém (Brazil), Douala (Cameroon), Danang (Viet Nam) and PK 45 (Congo). Moupfouma [26] has proposed a model for the cumulative rainfall rate distribution $P(R \geq r)$ which is given by:

$$P(R \geq r) = 10^{-4}\left(\frac{R_{0.01}}{r}\right)^b \exp\left(ur\left(\frac{R_{0.01}}{r} - 1\right)\right) \quad r \geq 2 \text{ mm/h} \qquad (13)$$

$$b = 8.22\, R_{0.01}^{-0.584} \qquad (14)$$

r (mm/h) is the limiting rainfall rate that is equalled or exceeded. $R_{0.01}$(mm/h) is the rainfall rate intensity exceeded during 0.01% of the time.

There are two variants of u. The first variant is given by:

$$u = \lambda r^{-s} \qquad (15)$$

where the values of λ and s are given in table 1 for the International Radio Consultative Committee (CCIR) rain climatic zones D to P. The second variant of u is expressed by a couple of values ($u1$, $u2$) such that $u1$ applies to high rainrates with probability $P(\%) \leq 0.01$ and $u2$ applies to medium and low rain

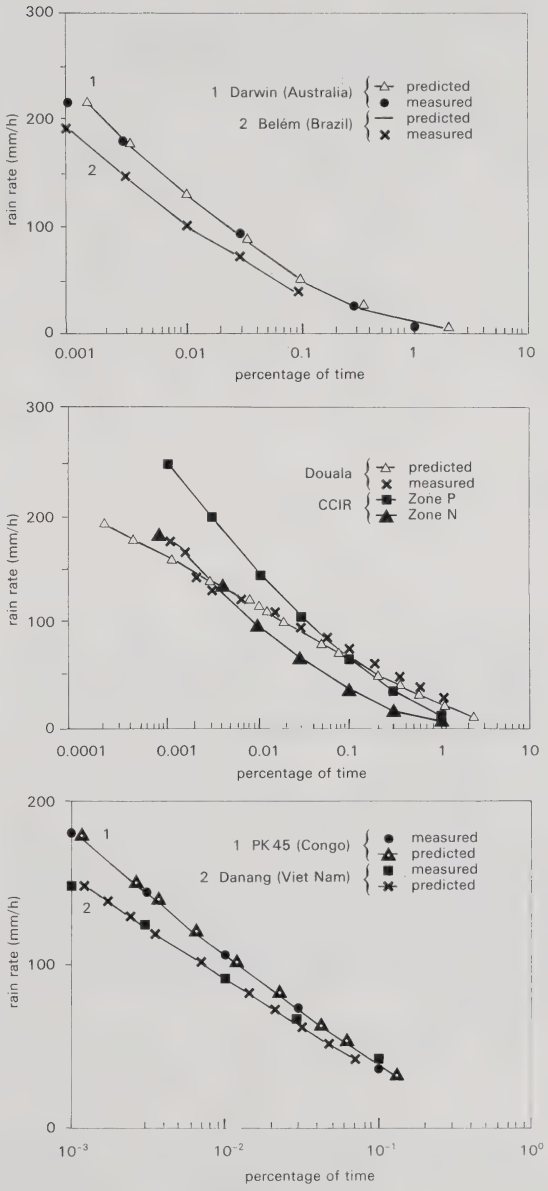


Figure 7—Cumulative rain distribution for some equatorial stations (after Moupfouma [26])

Table 2

Measured rainfall rate at Ile-Ife (Nigeria) for an integration time of 1 minute for various percentages of time

percentage of time rain rate is exceeded	rainfall rate R (mmh^{-1})
0.0004	140
0.0007	132
0.001	126
0.0015	120
0.003	100
0.005	90
0.007	84
0.009	80
0.01	78
0.02	62
0.03	50
0.04	40
0.05	34
0.07	26
0.1	20

rates with $P(\%) > 0.01$. The values of ($u1$, $u2$) depend on local geographical physical features such as mountains or water masses. Figure 7 illustrates the good agreement between equation *(13)* and observed data for Darwin and Belém, using the first variant of u and for Danang, PK 45 and Douala, using the second variant of u.

Table 2 shows the values of rainfall rate obtained by Ajayi and Ofoche [6] for Ile-Ife for the period September 1979 to December 1981 using an integration time of 1 minute. High rainfall rate is also evident on this table. Figure 8 further shows the characteristics of rainfall rate duration at Ile-Ife for the same period using the basic 10 second integration time. The number of occasions in a year when a specified rain rate was continuously exceeded for at least a duration Δt seconds is given as a function of duration from 10 to 1000 seconds and for rainfall rates from 40 to 140 mmh^{-1}. Empirically, the result can be expressed as:

$$N(R) = \alpha(\Delta t)^{\beta} \qquad (16)$$

$$\alpha = 3720 - 22.8\ R \qquad (17)$$

$$\beta = 0.82 \exp(0.004\ R) \qquad (18)$$

where $N(R)$ is the number of occasions in a year when specified rainfall rate R was continuously exceeded for duration of Δt seconds. The duration is directly related to the duration of fade due to rainfall attenuation. For instance there could be as many as seven occasions in a year when rainfall rate of 100 mmh^{-1} is continuously exceeded for 100 seconds and this could lead to serious signal fading due to rainfall.

Furthermore, the indirect method of obtaining 1 minute rainfall rates from long-term precipitation data, has been utilized to obtain contours of rainfall rates exceeded for various percentages of time. The long-term precipitation data (daily, monthly, annual) collected for 37 stations in Nigeria over an average period of 30 years were utilized.[17] The contours of the average rainfall rate exceeded for 0.01% of time are shown in figure 9.[17] In figure 9, it can be observed that for the southern parts of Nigeria the average rainfall exceeded for 0.01% of time varies from 100 to 140 mmh^{-1}. These figures are very much higher than those from the direct point-rainfall rate measured at Ile-Ife between September 1979 and December 1981. In the northern parts of Nigeria, the average rainfall rate exceeded for 0.01% of time varies from 70 to 100 mmh^{-1}. The classification of Nigeria into rain rate zones on the basis of figure 9 should be regarded as preliminary pending further comparisons with the direct point-rainfall rate measurements.

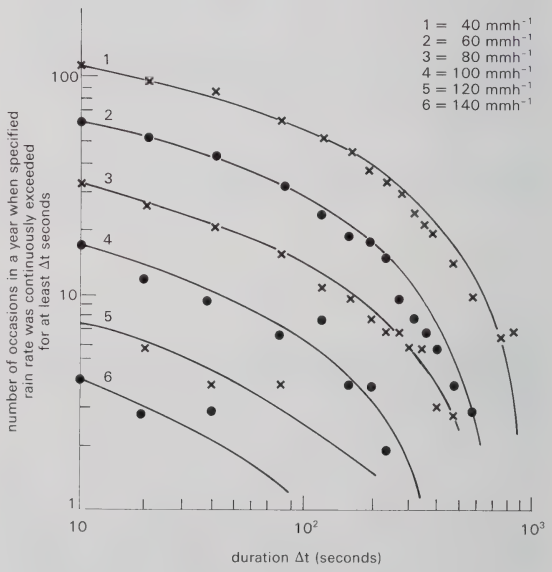


Figure 8—Characteristics of rainfall rate at Ile-Ife (Nigeria) (after Ajayi [2])

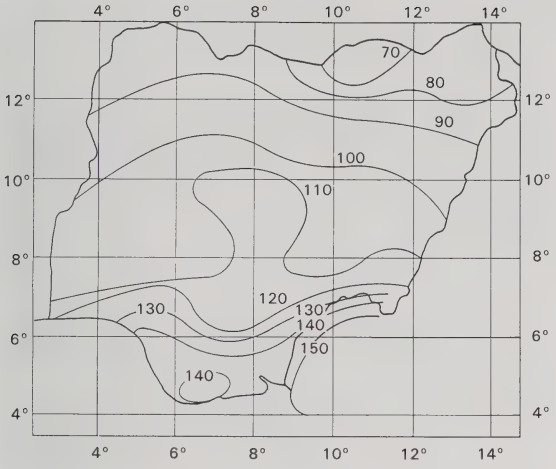


Figure 9—Average rain rate R *(mmh^{-1}) exceeded for 0.01% of time for Nigeria (after Ezekpo [17])*

The CCIR (1978)[12] classified the world into five rain climates (Zones 1 to 5). However, by 1982, the CCIR produced a finer rain climate classification resulting in 14 rain climates (Zones A to P) for the world. It will be appropriate to compare the various rain rate measurements described above with Zone 1 of 1978 classification or/and Zones M, N, P of the 1982 classification.

To begin with, figure 7 shows that the cumulative rain rate distribution of Zone P or N of the CCIR 1982 classification does not fit the observed data for Douala.

Table 3

Comparison of point rainfall rate measured at Ile-Ife with the values from CCIR Recommendations

percentage of time rain rate is exceeded	rainfall rate R (mmh^{-1})					Ile-Ife
	CCIR					
	1978	1982				
	L	M	N	P	contour	
0.001	155	120	180	250		126
0.003	115	95	145	200		100
0.01	75	63	95	140		78
0.03	45	40	65	105	100	50
0.1	20	22	35	65		20

Table 4

Comparison of estimated values of rainfall attenuation parameters with appropriate CCIR values

frequencies (GHz)	CCIR					Ile-Ife
	1978	1982				
	L	M	N	P	contour	
10	2.494	1.997	3.372	5.78	3.60	2.49
20	8.634	7.129	11.20	17.82	11.84	9.18
30	15.30	12.81	19.47	29.97	20.52	17.12
40	20.15	17.11	25.16	37.43	26.40	22.41
60	29.23	25.15	35.84	51.60	37.46	24.66
80	26.95	23.57	32.32	44.73	33.62	24.03
100	27.64	24.28	32.95	45.13	34.23	23.38

a) specific attenuation exceeded for 0.01% of the time

frequencies (GHz)	CCIR				Ile-Ife
	1978	1982			
	L	M	N	P	
10	0.241	0.272	0.491	1.083	0.239
20	1.152	1.272	2.131	4.208	1.209

b) effective uniform path attenuation coefficient (dB/km) exceeded 0.1% of the time derived from point rainfall measurement for typical path length of 30-40 km

frequencies (GHz)	CCIR					Ile-Ife
	1978			1982		
	L	M	N	P	contour	
10	1.030	0.284	1.392	2.388	1.487	1.044
20	4.031	3.328	5.226	8.318	5.530	4.332

c) effective uniform path attenuation coefficient (dB/km) exceeded 0.01% of the time derived from point rainfall measurement for typical path length of 30-40 km

Similarly table 3 shows that the rainfall rate data for Ile-Ife do not fit the M or N or P Zone of the 1982 CCIR classification nor does the observed value for occurence $\geq$ 0.01 of the time agree with the CCIR contour for Africa.[13] However a closer agreement is found between the observed data and the Zone 1 of 1978 classification.

Table 4 summarizes estimated values of rainfall attenuation parameters for Ile-Ife compared with appropriate CCIR values.[3, 5] Ile-Ife data also show much better agreement with the CCIR 1978 Zone I classification than with the 1982 Zone P or M or N classification or the CCIR contour for occurrence $\geq 0.01\%$.

3.4 Attenuation by atmospheric gases

Radio waves at centimetric and millimetric wavelengths propagating through the atmosphere can be attenuated due to molecular absorption by oxygen and water vapour. Oxygen has a series of very close absorption lines near 60 GHz and an isolated absorption line at 118.74 GHz. Water vapour has lines at 22.3, 183 and 323.8 GHz.[20] The total gaseous absorption in the atmosphere, A_a (dB), over a path length r_0 (km) is given in CCIR report [14] as:

$$A_a = \int_0^{r_0} \gamma_a(r)\, dr \qquad (19)$$

where $\gamma_a(r) = \gamma_0(r) + \gamma_w(r)$, γ_a is the specific attenuation in dB/km and γ_0, γ_w are the oxygen and water vapour contributions respectively.

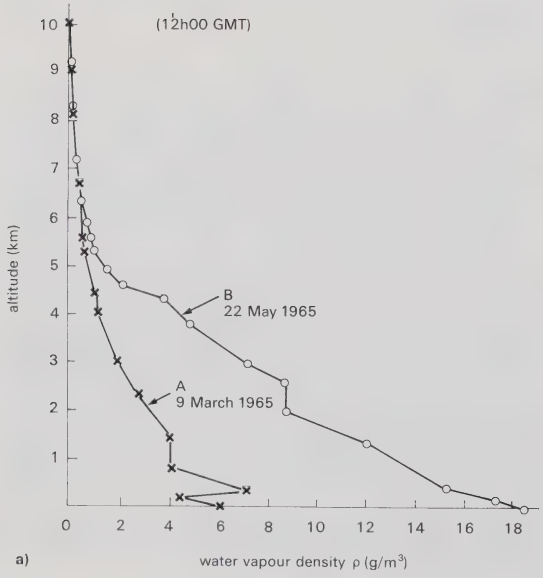
A table of γ_a for 1 to 350 GHz is given by CCIR.[14] The concentration of atmospheric oxygen is relatively constant whereas that of water vapour is not. The relationship between water vapour concentration ρ (g/m^3) and water vapour pressure e (millibars) is given by:

$$\rho = 216.7 \frac{e}{T} \qquad (20)$$

where T is absolute temperature (K).

Using radiosonde data, water vapour concentration has been found for stations in Nigeria and Niger [10, 11] and India.[33] Two altitude distributions of ρ are shown in figure 10.

The results of vapour concentration ρ (g/m^3) and water vapour content (g/m^2) in a vertical column of unit area cross-



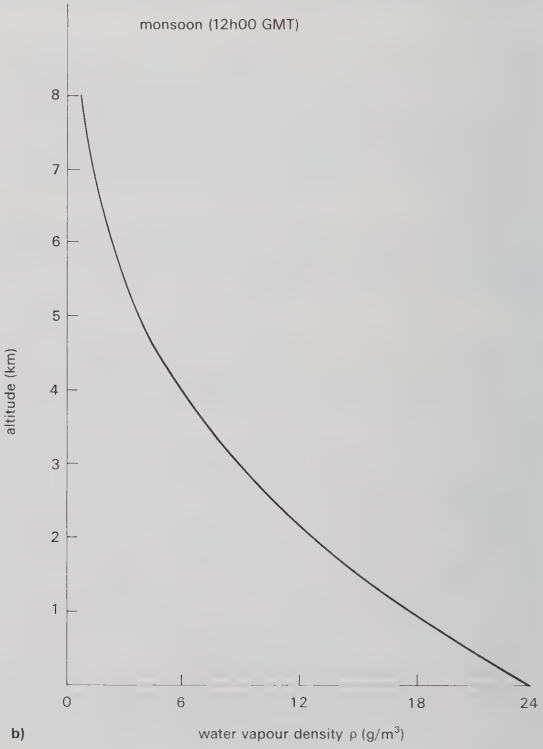


Figure 10—Variation of water vapour concentration with altitude: a) at Niamey in Niger (after Aro [10]); b) at Assam Valley in India (after Reddy [33])

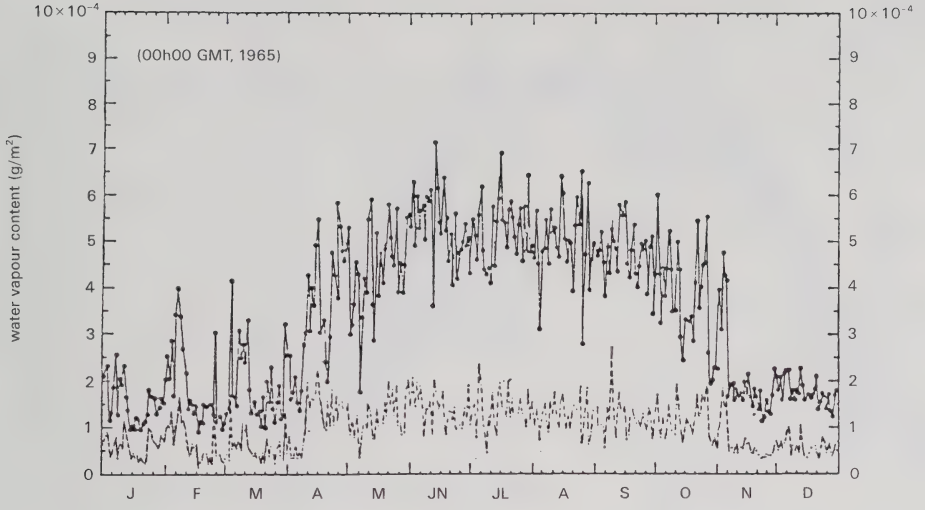


Figure 11a—Daily values of columnar water vapour content for Niamey in 1968; thick line 0 to 10 km column, faint line 0-3 km column (after Aro [11])

section for Niamey (Niger) and Oshodi (Nigeria) have been discussed by Aro.[10, 11] Oshodi (6.5° N, 3.4° E) is a coastal station near Lagos while Niamey (13.4° N, 2.1° E) is an inland station. Figures 11a and 11b show the time variations at Niamey for water vapour content in columns of 3 and 10 km and water vapour concentration at the ground at midday. There is a seasonal variation in both parameters with consistently higher values during April to October in the rainy season than during November to March in the harmattan period. The seasonal differences are most striking. A high variability in the daily values is superimposed on the seasonal trend. The vapour content for the 0-10 km column and the surface vapour concentration are highly, correlated with correlation coefficients better than 0.90. At the station, values of surface concentration of water vapour are consistently slightly higher at midnight than at midday; for example, the annual means for 00h00 GMT in the periods July 1964 to June 1965 and January to December 1968 were 13.6 and 13.7 g/m^3 respectively whereas each of the corresponding values for 12h00 GMT was 13.0 g/m^3. The diurnal differences are however much less important than the seasonal ones.

At the coastal station of Oshodi, water vapour content and water vapour concentration for midday vary only slightly about the annual mean values which were found respectively to be 4.77×10^4 g/m^2 and 21.1 g/m^3 for the period July 1964 to June 1965. The seasonal variations of water vapour content and water vapour concentration at Oshodi and Niamey are similar to the corresponding variations of surface refractivity in southern and northern zones of Nigeria.

For comparison, the contours of surface water vapour concentration in India at midnight in December [33] indicate values of about 18-19 g/m^3 for coastal stations at about latitude 10° and below, and between 8 and 13 g/m^3 for inland stations at about latitude 15°. These are in general agreement with the December midday mean value of 21 g/m^3 for Oshodi and midnight mean value of 8 g/m^3 for Niamey.

4. Conclusions

It is desirable to highlight the main results contained in section 2 and 3 and identify areas of need for future research.

For ground-wave propagation, determination of effective ground conductivity is important. A few measurements made in the south-western part of Nigeria estimated this to lie within 1 to 4 mmho/m for the equatorial region. More measurements are required for a much wider latitude coverage and

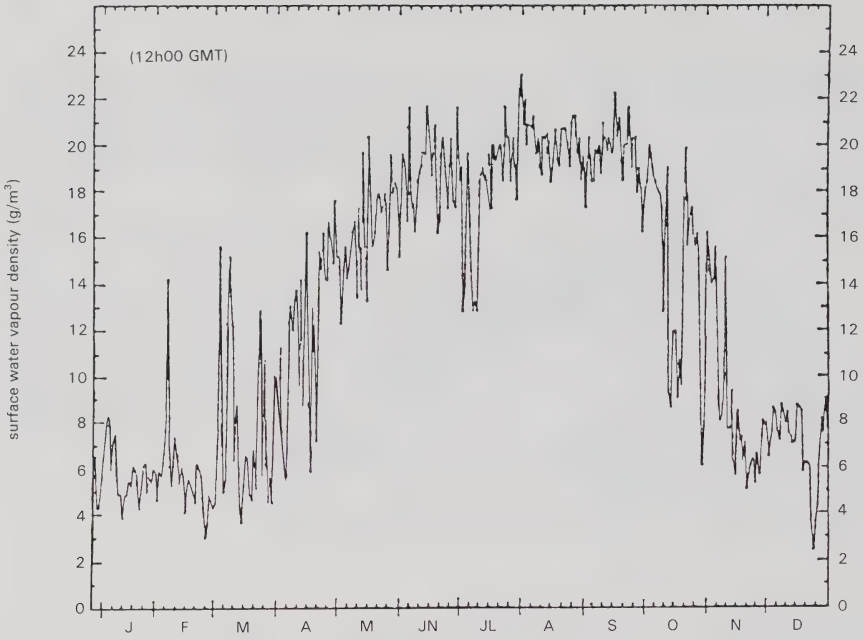


Figure 11b—Daily values of surface water vapour density for Niamey in 1968 (after Aro [11]). The position of Niamey in relation to Nigeria is shown in figure 1

to investigate seasonal variations and the dependence on radio frequency. For tropospheric propagation, refractivity gradient with height determines the path. What is readily available is surface refractivity N_s for which good agreement is found in the results for the African, American and Asian sectors; it is higher near the coast than inland and during the rainy seasons than other seasons. However, the need still exists for the experimental determination of the refractivity gradient. The harmattan season in West Africa, which falls between about November and January favours superrefractivity, giving rise to trans-horizon propagation at VHF which in turn act as a potential source of interference at VHF. The harmattan effect also represents indirectly, the effect of dust particles from the desert on tropospheric propagation. This effect deserves more intensive and extensive investigation at gigahertz frequencies.

The use of frequencies above 10 GHz for Earth-space communications calls for measurement of rainfall intensity rate and rain drop size distribution for the determination of rainfall attenuation. Recent measurements of these parameters in an equatorial environment suggest that CCIR rainfall rate classification may require a revision for the equatorial region and that a log-normal rather than the Marshall and Palmer law distribution gives a better fit to observed rain drop size distribution in the equatorial region. The desirability of further work on this subject has been emphasized by CCIR. More measurements of water vapour concentration to have wider geographical coverage is also desirable in order to improve prediction of centimetric and millimetric wave attenuation due to atmospheric gases in the region.

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The changing telecommunication environment*

by R. E. BUTLER
Secretary-General of the ITU

ABSTRACT

This article discusses the changing telecommunication environment and its implications for the forthcoming World Administrative Telegraph and Telephone Conference (WATTC-88), to be held in Melbourne in December 1988. It considers some long-term aspects of the new environment which require attention in a world telecommunication network comprising many different shades of deregulation or, in terminology now gaining prominence in the telecommunication vocabulary, liberalization, privatization or competition.

Introduction

THE International Telecommunication Union (ITU) is the intergovernmental organization mandated to deal with the multilateral issues of telecommunications and it should be recognized that telecommunications are, by their very nature, strongly multilateral.

The purpose of the Union is to produce an international or regional consensus on telecommunication matters which is obtained through the countries concerned negotiating between them the rights and obligations which the parties to an agreement, i.e. governments, will have vis-à-vis one another. Each country reserves the right to regulate its telecommunications in accordance with its own national law but the application of the latter is tempered by the built-in and compelling need for agreements with the other parties concerned.

These agreements can take various forms and may cover such specific matters as the frequencies, or channels, to be used by broadcasting stations or, as in the case of the forthcoming World Administrative Telegraph and Telephone Conference (WATTC-88), the rights and obligations, including rules to be observed, of governments vis-à-vis each other with respect to international telecommunications and in making telecommunications facilities available to the public; the word "public" being used in a broad sense to include also business and general government use. These agreements also provide the frameworks under which entities involved in international telecommunications conduct their activities. In considering the scope of such action, we must keep in mind that one of the basic purposes of the ITU is "international co-operation between all Members of the Union for the improvement and rational use of telecommunications of all kinds ..." [1]

All this may sound rather abstract, but the case of planning the use of the radio-frequency spectrum – the laws of physics are such that radio waves cannot be contained within man-made frontiers – clearly illustrates that such agreements are essential if telecommunication services are to operate properly.

* This article is based on a keynote speech given by the Secretary-General of the International Telecommunication Union at the *1987 Annual Conference of the International Institute of Communications* (Sydney, Australia).

Regulatory background

I have referred to the World Administrative Telegraph and Telephone Conference. I feel that this title needs some explanation.

Firstly, the term *administrative* refers to a category of ITU conferences, namely conferences empowered to draw up administrative regulations which, in fact, can be anything but "administrative". Such regulations can be highly technical in content. Broadly speaking the term just means applicable by administrative procedures or obligations.

Secondly, why *telegraph* of all things? "Telephone" is still understandable, but telegraph sounds very out-of-date.

Here we have to understand something rather special about the old-fashioned international telegram service which is often overlooked. The telegram service was far more than a telecommunication service – it was also a messenger service. It not only provided for the transmission – over the telecommunication network – of the text of the message, but, equally important, it provided for the delivery of the telegram to the addressee in person. If he had moved, the telegram would be sent on. All this and more was the subject of a set of elaborate regulations known as the *Telegraph Regulations.*

By the mid 60s, there was a wide feeling that the time had come to simplify the Regulations given the increasing use of telephone, the decrease in the use of telegrams, as well as the need for greater operational efficiency. In fact it was decided to transfer the procedural issues to the International Telegraph and Telephone Consultative Committee (CCITT) Recommendations which could be up-dated by CCITT Plenary Assemblies without having to renegociate a new international instrument. It also avoided the cost of holding an administrative telegraph and telephone conference for this purpose.

This resulted in the adoption, 14 years ago, of greatly simplified Telegraph Regulations which contained only matters of fundamental principle. At the time, and influenced by the experience of using simplified rules for the telex services, it was felt to be still too early to regulate data type services in detail, but rather that the rules for the public telegram service should be used as guidelines, etc.

The Telephone Regulations were always rather simple as many issues could be dealt with by the operators concerned. It was mainly a question of having an internationally approved set of instructions for operators, particularly as the range of problems likely to be encountered was small due to the relative simplicity of the telephone service.

The changing environment

The time has now come to go a step further and to produce a general set of principles applicable equally in a regulated and deregulated environment and without being tied to a specific telecommunication service.

A Special Preparatory Group of the CCITT has, in the course of a series of meetings held during the last two years, prepared some draft texts. WATTC-88 will be considering these proposals along with proposals of Member countries. Provision has to be made beyond the year 2000. We cannot afford to hold such conferences often, because there are other equally important issues requiring international consideration.

The basic philosophy adopted by the preparatory group was that of the early 70s, i.e. Administrative Regulations for

matters of principle and CCITT Recommendations for procedural and operational matters. It will be very interesting to observe how this will work in practice in an environment of progressing national deregulation and with the advent of changes where even the traditional distinctions between the classic services are becoming blurred. In addition to this there is the possible impact of the new services which are evolving. Some of these services are not entirely telecommunication in character. They are certainly not the classic services as we know them. However, they depend upon the availability of a telecommunication infrastructure, and it is these aspects that will need special attention in the Melbourne Conference.

Issues of principle, as yet unforeseen, could surface in the years to come; issues which might need to be considered from a strictly government perspective–rather than by operating agencies or other parties directly involved in international telecommunications–because their consequential impact would reach beyond the strictly telecommunication aspect of the matter. Possible areas where this might occur are reliability in connecting networks, electronic fund transfers, privacy, etc. Other issues, such as the significance of the telecommunication sector as a vital element in the sustenance of the national and indeed service economies are already with us.

To comprehend the complexity of the matter we have to keep in mind the diversity of information and telecommunication services possible in the new environment and that the distinction between these two kinds of services will be difficult to establish. I shall not go into the distinctions between "hardware services" and "facility offerings", but instead draw attention to an excellent presentation, full of foresight, entitled "*A challenge to regulations by computer communication*" [2] made by Mr Y. Makino, former Director-General in the Ministry of Posts and Telecommunications of Japan, at the International Conference on Computer Communication (ICCC) in 1978.

The new environment is also typified by new types of operating agencies and new categories of specialized customers or general users. The new operating agencies are not traditional telecommunication service suppliers, they are themselves users of the network. The new users include entrepreneurs whose basic operations depend upon telecommunication. The whole viability of the projects of these entrepreneurs will hinge on the availability of *reliable and reasonably priced telecommunications*. The success of government ventures in promoting small businesses and industries, informatics and indeed high technology ventures will in turn depend on some of these services. Others may seek to provide their own international telecommunications as an extension of their "traditional" functions.

It is this diversity of possibilities which makes the Regulations to be drawn up by WATTC-88 so significant. The work of the Conference will form an important threshold in the development of ITU regulatory texts.

Different approaches

International telecommunication Regulations are not made for amusement or to enhance the power of administrations or telecommunication operating agencies. They are designed to deal with real or potential situations and when one is concerned with an organization of 163 Member countries then the need for sound texts is evident if there is going to be cohesion and harmony of action. In this regard, any partnership–private sector or public–will demand the application of certain basic principles to obtain the cohesion necessary for the achievement of effective results. As numbers of partners and diversity increase, the rules, obligations and arrangements will have to respect that diversity.

This need for effective agreement has always been evident in Europe where a number of countries have areas of high population densities bordering on similar areas in neighbouring countries and where the social and economic exchanges between these areas has always been strong. International planning and compatible technical and administrative practices on both sides of the border are essential if public and specialized telecommunication services are to operate satisfactorily.

Historically, Europe is important in the development of international co-operation in the field of telecommunications. Indeed it provided the drive for the establishment of the Union in 1865. As the telephone and later radio developed, we had a significant drive for further international regulation starting in the 1930s and then developing in the 1950s and 1960s.

Europe is also the home of the PTTs, those institutions which have, in some minds and frequently unfairly, been held responsible for slow progress towards new telecommunication offerings and also for restricting or retarding innovation by users, without due consideration being given to the political factors which may have determined their tariffs and policies. The ITU has sometimes been called the "ITU of PTTs" which is clearly far from correct if one looks at the identity of the actual government departments which represent their respective countries in the ITU and the increasing diversity of participants in our work.

Against this "conservative" (PTT) perspective, we have to compare the North American approach which has generally favoured the use of private enterprise for the provision of telecommunication services but which also applies substantive government regulation to such telecommunication entities, be they monopoly telephone companies, record carriers operating in a competitive environment or broadcasters.

The significant thing to note is that the European-style PTT control is not, or was not, the same thing as regulation in the

United States. Deregulation in the United States–or elsewhere where an essentially private-enterprise oriented but monopolistic (at least within areas) telecommunication-service-providing industry was "deregulated"–should therefore not be seen as comparable to the privatization or liberalization of PTT structures or the introduction of an element of competition into countries where such structures exist.

This is not just something tied up with tradition, but a matter of basic approach when it comes to international co-ordination.

Here I wish to emphasize that what I am going to say is not a value judgement, but just an analysis of what happens.

A PTT generally, when seen from another country, acts–even when dealing with the introduction of a new service–as having a reasonably well defined view of its own "territory". PTTs having the monopoly of all public telecommunication services in a country do not have a problem of finding customers in a territorial sense, the customers are already there. It is a question of providing the new service on as wide a geographical basis as possible and then persuading the customers to use the new service. Nevertheless, the matter is not without problems and more particularly there is the need to obtain sufficient capital both for investment in traditional services as well as to make available new services. Furthermore, the public today is not willing to wait for the introduction of such services at a pace corresponding to the levels of financial provision and expenses which have been characteristic of our sector, as let us say for the telephone, during past decades.

The commercial telecommunication provider seeking to enter a deregulated market, on the other hand has–unless he is already providing some other telecommunication or allied service–the task of establishing an adequate customer base. He is faced with a problem of "critical mass", a sufficient number of users and an adequate amount of paid traffic relative to a given system outlay. Incidentally, we see this "critical mass" approach evolving within Europe in regard to satellite television reception and its competition with the cable television service providers.

The new commercial telecommunication service provider might, on some occasion, perceive a problem of potentially "unfair" competition and cases will arise where there is therefore a desire to seek some kind of regulation for a particular issue which may affect his commercial viability rather than the more fundamental type of rights from which a PTT, or for that matter any other monopoly operator, could derive commercial advantages.

Participants in a deregulated environment will, consequently, be more interested in specific measures while the traditional PTT will be more concerned with principles which they can interpret to enable them to elaborate rules and regulations for country-wide application.

In all of this, some formal regulatory mechanism is of course needed to protect the public interest in regard to pricing and service quality.

A look into the future

We have to face the fact that we are still a long way off understanding how to handle deregulation or privatization on a global scale. It is true that, in part under the pressure of new technology and capital users, we are now witnessing a "commercialization" of telecommunications together with a weakening of the "territorial" perspective of how monopolies see their rights. This phenomena will continue.

Nevertheless, we cannot ignore the fundamental concept of basic telecommunication services to be made universally available (i.e. national and international) at an affordable price–or as the International Telecommunication Convention puts it" ... generally available to the public". Neither can we overlook that such a service has yet to become a reality for over two thirds of the Members of the Union.

The Independent Commission for World Wide Telecommunications Development having examined the state of the networks in the different parts of the world stated that "In large tracts of territory there is no system at all. Neither in the name of common humanity nor on grounds of common interest is such a disparity acceptable."[3]

The current preoccupation with deregulation in some countries and privatization in others as well as various shades of both has brought an added dimension to telecommunication development world-wide. Authorities are faced with the challenge of handling the exponential growth of new technologies and services along with an alarming rate of obsolescence of costly equipment on one hand, and the ownership, orderly growth, management and operation of services essential to the public, i.e. telecommunications, on the other hand.

All countries are now fully conscious of the importance and the need for increasing the availability of telecommunication services to individuals, business and the public as a whole. It is also generally accepted that the necessary resources and technology are now available *"...to bring mankind within the reach of a telephone ..."*. But the rate of growth of telecommunications in many countries is not satisfactory and hence they are searching for new ways and means to accelerate growth.

The mobilization of the necessary capital is a problem in itself and this has brought with it the need for considerably more progressive financial management.

The question that has become of prime concern especially to the Third World today is: Will deregulation/privatization

accelerate the harmonious growth of telecommunications at the national level or will the profit motive that is underlying these concepts increase the already unacceptable gap between the urban and rural areas?

In this connection, I would mention a particularly significant study entitled *Investing in telecommunications* [4] undertaken by the ITU.

This study concluded that putting the provision of telecommunication services onto a commercial footing in developing countries would be inducive to development. The adoption of a commercial approach could help highlight practices which hindered investment such as, among other things, use by the government of telecommunication revenues for non-telecommunication purposes. The importance of autonomy in the planning, management and operation of a telecommunication service subject to government and ministerial direction and oversight was emphasized as also the need for adequate capital from a diversity of sources including a large measure of self-financing.

These features were also considered important for the establishment of the appropriate climate for bilateral and multilateral investment and arrangements which could facilitate the more rapid expansion of networks and services.

We see from this kind of reasoning that economic pressures are going to play an important part in the next decade or so in the formation of telecommunication policy and this even for countries which are primarily concerned with the provision of basic services such as the ordinary telephone.

There could also be long-term repercussions of the new environment, such as the way deregulation in some countries might shape international telecommunication policy in 10 to 15 years time.

I believe that we need to anticipate such things before we are practically confronted by them. Indeed, the ITU has always had to look well ahead in doing its work and especially in regulatory conferences. In particular, we should give some thought to issues which might arise from the varied perceptions which different countries could have of the scope and operation of deregulation.

With the exception of a few CCITT Study Groups, including Study Group III (General tariff principles including accounting), which as its title implies addresses this context from a specific angle, little consideration has been given to this kind of thing in intergovernmental fora. The Organization for Economic Co-operation and Development (OECD) has discussed some points, but it has both a numerically and economic-spectrum limited membership. The operation of OECD is also different to the ITU in that its procedures are not oriented towards the establishment of regulatory texts as is the case of the Union.

The General Agreement on Tariffs and Trade (GATT) is to some extent involved. The question of telecommunication equipment supply and market access is already receiving attention in GATT and is expected to come forward in the Uruguay Round of negotiations. However, the service issue and the related responsibilities have many definitions and connotations and the ITU will be following closely the issue of service negotiation in the Uruguay Round in order to avoid the duplication of potentially related international legislation at treaty level. There is need for a clear understanding of the issues by the telecommunication authorities and the GATT parties, in particular at the national level.

In the ITU we have considered these matters more informally in our joint International Telecommunications Users Group–INTUG/ITU conferences, USERCOM 85 [5] and USERCOM 87, [6] as well at the Washington Round, also held in 1985, and other sessions of the World Telecommunication Forum. A post-WATTC USERCOM is being considered for early 1989.

What can we say about the type of things governments and telecommunication operating entities will need to know when many kinds of telecommunications become internationally interconnected in an environment with many shades of deregulation and privatization?

The first and perhaps most important requirement is some means (I am referring to a form of text) for determining the hierarchy of responsibilities when various circuits and services are concatenated. In this regard, the question of privacy, security, accessibility of communication along with their impacts on the individual, the institution and the government, and the related obligations, have all to be carefully thought through.

The basic instrument of the ITU, the International Telecommunication Convention, contains provisions which in some way address problems of this kind, namely: Article 19 "Stoppage of Telecommunications", Article 20 "Suspension of Services" and Article 22 "Secrecy of Telecommunications". These texts go back virtually to the establishment of the Union long before current developments could be foreseen.

Nevertheless, the important factor is not the actual wording of these texts, but the notion of national telecommunication sovereignty which they embody.

The significance of telecommunication sovereignty tends to be underestimated nowadays and this is probably normal in view of the trend towards deregulation. Yet, if a country can deregulate then it does this by virtue of applying its *own national telecommunication sovereignty.* In this connection, I venture to suggest that no country could–as a matter of principle as distinct from political will–formally affirm that deregulation is an irreversible process. It would be setting the precedent of depriving itself of the power to legislate with respect to what happens within its frontiers.

Obviously this cannot happen.

Deregulation will not only require new perspectives on international regulation and standardization, but it is also likely to change the basic approach to the subject.

A factor which could, in the long term, become a particularly significant issue in deregulation is the time scale for foreseeing problems which might require international legislation.

It could be said that the approach to regulation of the old style PTTs tended to be slow and cautious. One can argue whether to describe it as unresponsive or sure-footed – probably sometimes one, sometimes another. Nevertheless, once they were convinced that their interests were at stake they would act decisively and often with considerable foresight.

The situation resulting from deregulation will be very different. New innovations and entrepreneurial freedom will mean that the range of possibilities will have to be kept as open as possible so as not to hamper or obstruct innovation. While this is certainly a desirable condition, it does raise the question of whether a tendency towards a possible regulation "after the fact" – one intended to put out a fire rather than forestall one – is viable in the long run.

This could apply in particular if such a tendency resulted in regulatory or quasi-regulatory agreements which are so "case specific" – dealing with narrow commercial issues – that they would, in practice, point to lacunae between regulated areas.

So we shall have to find an approach which will bridge the potential gap between past and future regulatory policies.

In addition to this, the new environments could very well affect the national decision on who – what body – is to represent a country in the ITU in the future, including all bodies such as conferences and plenary assemblies of the Consultative Committees (the International Radio Consultative Committee (CCIR) and the CCITT) where long-term decisions with significant consequences are being made. It cannot be ruled out that the economic role of new technologies and new services may become so important that new players will emerge.

Conclusion

We are still a long way from understanding the impact of deregulation and privatization which are revolutionizing the already fast moving state of telecommunications in our world. Yet, a prime concern must remain the promised universal telecommunication service to the two thirds of humanity that is still today without the basic telephone service. Will deregulation/privatization promote or hinder the general availability of telecommunications to the public as a whole? Will it increase or diminish the gap of service availability within the industrialized world as well as within the national environments of the developing world?

Furthermore, these problems are made more difficult by the generalized descriptions used in the present debate. For example, the term "privatization" at present has many divergent meanings and gives rise to different perceptions depending upon who uses it.

I might mention that in the ITU I have already received requests from senior government policy-makers (especially in some medium developed and developing countries) asking for views as to what direction to take or what policy to adopt vis-à-vis deregulation/privatization. Each country is different and there is no easy or ready-made reply which can be given to such a complex question. I have therefore decided to call on a small advisory group to help in the analysis of the issues at hand, thus providing information to facilitate action by the national policy makers concerned.

Telecommunications already play a key part in our daily lives. While the developing countries are, at best, on the threshold of telecommunication service availability, there is still, even in the highly developed countries, considerable scope for expansion both in the variety and the distribution of telecommunication services, the tendency being towards a much greater diversity of choice. We have to look towards this future with determination, courage and understanding, as well as a willingness to act in harmony.

(Original language: English)

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News

United Kingdom Lords Committee press for more competition in EEC telecommunications

☐ The report of the House of Lords European Communities Committee on European Community telecommunications policy[1], published on 16 December 1987, states that the European Community should follow Britain's example in introducing more competition into the telecommunications market. It should be the ultimate objective for monopoly telephone services to be eliminated from all EEC countries and for most subscribers to have a choice of service.

In particular, the Lords Committee see no reason why other EEC countries should not follow the United Kingdom in doing away with the requirement that each subscriber's first telephone should be rented from the system operator. Consideration should also be given to the setting up, throughout the EEC, of regulatory bodies which, like Oftel in the United Kingdom, are independent of system operators.

The Committee has found no convincing justification for limitations on resale of spare capacity on leased lines. Such limitations currently apply in all member States but in the longer term ought to be eliminated.

The Committee's report applauds the initiative taken by the Commission of the European Communities in the Green Paper[2] on the development of the common market in telecommunications, presented to the Council of Ministers in July 1987. A common market in telecommunications is needed if the potential of modern developments in telecommunications technology is to be fully exploited. The opening up of a European Community market will enable European firms to continue to compete internationally in a field where national markets are no longer large enough to justify the development costs of advanced telecommunications systems.—*House of Lords, United Kingdom.*

[1] The 6th Report (1987-88) from the House of Lords Select Committee on the European Communities, *European Community telecommunications policy* (HL Paper 25), is available from HMSO. Price: 9.30 pounds sterling.

[2] Commission of the European Communities: *Towards a dynamic European economy: Green Paper on the development of the common market for telecommunications services and equipment.* COM(87) 290 final.

Saudi Arabia telex and data networks joint venture

☐ British Telecom is to run Saudi Arabia's telex network, under a joint venture agreement that forms the company's biggest-ever overseas contract.

The 3-year deal is worth 161 million Saudi riyals (nearly 25 million pounds sterling) and started in January. It covers the management, operation and maintenance of the country's telex, teletex and data networks as well as maintenance of the telegraph network. Training of Saudi nationals also forms part of the contract.

British Telecom will hold 49% in the joint venture, the balance being held by a local company, *Haji Abdullah Alireza Ltd.*—British Telecom.

Joint venture in Grenada

☐ Recent talks held in Grenada have resulted in a firm commitment by the government of that country and Cable and Wireless to form a joint company, registered in Grenada, to operate all internal and external telecommunication services in the State. This new company will take over the assets of the Grenada Telephone Company and those assets of Cable and Wireless located in Grenada and Carriacou. Both companies are already well advanced in their separate development plans to modernize the country's communications.

Formal discussions between the government and Cable and Wireless will begin early this year to determine the structure of the joint venture company, and it is intended that agreement will be reached at these talks for the new company to be launched by 1 July 1988.—*Cable and Wireless.*

Network surveillance systems for India

☐ The Ministry of Communications, Department of Telecommunications (India), has awarded a contract to *Wandel & Goltermann* (Fed. Rep. of Germany) for the supply of four independent network monitor-and surveillance systems to be installed at New Delhi, Bombay, Calcutta and Madras. Each system comprises a central computer system with hardware and software *(IMSS)* and a number of remote measuring systems *(FDM 200).*

The task of this network monitoring and surveillance system is to analyse and statistically evaluate the performance of the analog trunk networks in order to help maintenance to improve performance, which in turn will lead to better call completion rates and increase of trunk revenue.

The contract is worth almost 5 million deutsche Marks.—*Wandel & Goltermann.*

63 more countries on ISD from India

☐ International subscriber dialled telephone service from India has been extended to cover an additional 63 countries making a total of 150 countries as of 20 November 1987 available by direct dialling to subscribers in more than 450 cities in India.

For ISD calls, the following pulse rates apply (one pulse equals one local call): Zone 1: 2.0 s, Zone 2: 1.2 s, Zone 3: 1.0 s.

The countries falling under Zone 1 are neighbouring countries; Zone 2 countries in Africa, Europe, the Gulf, Asia and Oceania; Zone 3 American continents and other places in the Western hemisphere. – *Videsh Sanchar Nigam Limited.*

Swedish digital network

☐ *Swedish Telecom* is now operating a nationwide digital telecommunication network. Anywhere in Sweden a customer with a digital PABX can now be digitally linked to the telecommunication network and thus transfer data at 64 kbit/s. Household subscribers will also notice the benefits of quicker connections, and an improved success rate when making trunk calls. Last year Swedish Telecom invested close to 1 billion United States dollars in the network.

The cornerstone of the Swedish digital trunk network is the group of over 80 *AXE* exchanges spread over the country. These are interconnected by coaxial cables, radio-relay links and optical-fibre cables. Linking of calls between exchanges is controlled by the common channel signalling procedure (CCITT No. 7).

The digital network also includes some old coaxial cables, but all new trunk cabling is in the form of optical-fibre cables, which are currently being laid by Swedish Telecom at the rate of 2000 km per year. This year the complete skeleton framework of an optical-fibre network will be ready, and by the early 1990s optical-fibre systems will be found in most of the main Swedish telecommunication network lines. – *Swedish Telecom.*

British Telecom starts itemized billing service

☐ British Telecom is to spend 87 million pounds sterling on providing itemized telephone bills for its customers. There will be no charge for this service.

The service started in January with more than 30 000 customers in the London area.

By spring, customers in Birmingham, Edinburgh, Glasgow and Bristol will also start to receive itemized bills and by 1990 the service will be available to almost 90% of London telephone customers and about half the customers in the rest of the country.

Itemized listings cover all dialled calls of 10 units and more (i.e. those which cost more than about 50 pence).

Bills will show:

- the date and time that a call is made,
- the number called,
- the duration of the call,
- the cost of the call.

The cost of making all other calls will be shown as a bulk figure on the bill. Operator-assisted and special service calls will continue to be itemized as in the past. – *British Telecom.*

Teleglobe launches first text to fax message service

☐ Teleglobe Canada Inc. is introducing an international message service that permits communication between text and facsimile terminals. This service, called *Globefax*, will enable users of personal computers and other ASCII text terminals to transmit documents or messages directly to overseas facsimile terminal destinations. The comprehensive range of features in the Globefax service will enable users to realize important cost savings over present operating practices. It will also accommodate a wide variety of user input terminals, which include facsimile terminals of Groups 1, 2 and 3.

The Globefax service, coupled with the current *Globetex* offering, will allow users to access both facsimile and telex terminals worldwide. – *Teleglobe Canada.*

Optical-fibre cable network study in Northern Ireland

☐ The international Ewbank Preece Consulting Group recently completed a feasibility study for a new optical-fibre cable network (OFCN) in Northern Ireland. The network is designed to improve the quality of data communication services throughout the province, and to provide new facilities in areas where these services are otherwise unlikely to become available. Commissioned by the Industrial Development Board of Northern Ireland, the study commenced in November 1986. Ewbank Preece's report was submitted in February 1987, and the European Economic Community (EEC) has just announced that Northern Ireland will receive 15.35 million pounds sterling under the special telecommunications action for regional development to provide an optical-fibre ring around the province with connections to Dublin and the United Kingdom mainland.

Study work comprised: an assessment of the potential number of OFCN users with particular reference to small and medium sized businesses; consideration of anticipated interdependence of the OFCN with existing and planned communication services; a forecast of the network's economic viability; recommendations to increase awareness of OFCN applications and benefits. – *Ewbank Preece.*

Undersea link between India and the United Arab Emirates inaugurated

☐ A 2000 km coaxial cable submarine system link between India and the United Arab Emirates, supplied by STC Submarine Systems, was officially inaugurated on 10 November 1987 with ceremonies at the two landing points of Bombay and Fujairah.

Following the submission of international tenders, the 57 million United States dollar contract was awarded to STC in September 1986 by the two co-owners, *Videsh Sanchar Nigam Limited* (India), and *The Emirates Telecommunications Corporation Ltd.* (United Arab Emirates).

This first coaxial link between the two countries will meet the growing demand for telecommunication services in the region as well as providing diversity of routing for international traffic.

The new system, offering 1380 circuits, is designed for a 25-year working life on the sea bed and is capable of carrying speech, telex, facsimile and data traffic. – *STC.*

Tasman-2: an optical-fibre cable

☐ The Overseas Telecommunications Commission (Australia) and the New Zealand Telecommunications Authority have awarded a contract for the laying of the *Tasman-2* submarine cable to *Submarcon*, a subsidiary of the *Alcatel NV* group.

The optical-fibre submarine cable, which will be 2500 km long, will cost 58 million ECU.

Tasman-2 will provide a link between Australia and New Zealand and is to be extended at a later stage to the United States and South East Asia.

Tasman-2 is a second-generation optical-fibre cable with a 20 000 digital link capacity. – *Alcatel.*

EUTELSAT Assembly of Parties considers "ASTRA" and says yes, but ...

☐ The European Telecommunications Satellite Organization's Assembly of Parties, the Organization's top level policy-making body, has drawn attention to the need for very strict observance of all of the conditions for co-ordination of the *ASTRA* satellite with the EUTELSAT system. These conditions are:

a) the satellite is to be used for one-way audio-visual transmissions only;

b) there is to be no material change in the operational scope of the satellite;

c) there is to be no loss of business from EUTELSAT to the ASTRA satellite over and above the four transponder leases foreseen by Luxembourg and the United Kingdom;

d) there is to be no material extension of the services to be provided, or use of the satellite beyond 1998;

e) there will be an increased joint effort and aggressiveness by EUTELSAT and its signatory organizations (the PTTs and authorized telecommunication operating agencies of Europe), in marketing EUTELSAT services and capacity throughout Europe.

Any breach of a), b), c) or d) will require new consultations, as would participation by any Party or Signatory other than Luxembourg and the United Kingdom in use of the ASTRA satellite.

In thus endorsing the recently-agreed conclusion of the Organization's Board of Signatories on this matter, the Assembly has shown itself particularly determined to maintain equitable conditions for the development and operation of services provided by the EUTELSAT satellites and is counting on the continuing vigilance of the Board of Signatories and the dynamic actions of its member entities to retain the economic vitality of an Organization in which 26 European countries have made very heavy investments. Three EUTELSAT satellites are now in orbit, one more will be launched in 1988 and four second-generation spacecraft are being built for launch from 1990. The Assembly also noted that studies in respect of the third generation were commencing soon.

Other business dealt with by the Assembly included:

- acceptance of co-ordination with *Télécom-1*, the French satellite system providing French domestic sound and television programmes to limitrophe countries;
- acceptance by EUTELSAT of the rights and obligations provided for in the United Nations Convention on International Liability for Damage caused by Space Objects.
- *EUTELSAT.*

Proposal for INMARSAT to provide land mobile services

☐ The Government of the Federal Republic of Germany has proposed amendments to the international agreements covering the operation of the International Maritime Satellite Organization which would enable the organization to provide land mobile-satellite communication services.

The amendments include changing the formal name of the 53 member country international co-operative organization from International Maritime Satellite Organization to International Mobile Satellite Organization, while retaining the possiblility of keeping the acronym INMARSAT.

INMARSAT, which was formed in 1979 and went into operation in 1982, currently operates a nine-satellite global system providing a wide range of communication services to more than 6200 ships and other units. It will begin providing similar services to aircraft this year.

The Director General of INMARSAT, Olof Lundberg, emphasized that the amendments did not confer on INMARSAT any exclusive monopoly right to provide land mobile services.

"If adopted, the amendments would enable INMARSAT to use its expertise and resources to bring recent developments in the production of small, portable satellite communication terminals to all those who need mobile communications—at sea, in the air or on land," he said.

"The economies of scale that this would achieve would benefit all users."

The proposed amendments will now be circulated to other member governments and Signatories. The meeting of the INMARSAT Council, at which major Signatories are represented, scheduled for March, could then approve the changes to the Operating Agreement and express its view on the changes to the INMARSAT Convention to the Assembly.—*INMARSAT.*

India plans satellite network for scientific experiments and remote sensing

☐ The Administration of India plans to establish a satellite network SROSS-II intended for scientific and remote sensing experiments. The mission objectives of SROSS-II are to carry out experimental studies in the area of cloud stereoscopy, geology and cartography through the monocular electro optical stereo scanner (MEOSS) payload which will be on-board satellite. The MEOSS payload will be provided by the Federal Republic of Germany. The spacecraft will also carry a scientific payload to detect Gamma-ray bursts.

General characteristics of the network are as follows:

- identity of the satellite network: SROSS-II (stretched *Rohini* satellite, series II);
- date of bringing into use: 29 February 1988;
- orbital information: angle of inclination: 45.6° ± 0.5°; period: 93.59 min; apogee: 401 km; perigee: 385 km; number of satellites: 1.

The system will comprise eight earth stations at Shriharikota, Ahmedabad, Hyderabad, Car Nicobar, Trivandrum, Lucknow, Bangalore, Weilheim (Fed. Rep. of Germany).

Up-link frequencies used will be: 149.522 MHz (telecommand); 2067.897 MHz (telecommand and ranging).

Down-link frequencies will be: 137.44 and 2210.00 MHz (telemetry); 2245.68 MHz (ranging).—*International Frequency Registration Board (IFRB).*

Global aircraft satellite services launched

☐ *SITA*, international organization grouping 324 member airlines, has recently reached agreements with telecommunication agencies of Australia (OTC—Overseas Telecommunications Commission), Canada (Teleglobe) and France (DGT—*Direction générale des télécommunications*) for the joint development and provision of aeronautical mobile satellite communication services. Satellite data and voice communications for aircraft safety purposes and in-flight passenger telephone will be offered to the aviation community from 1989 onwards.

Airliners, business, private and other aircraft while in flight will be able to communicate to any location on Earth, via geostationary satellites (such as currently operated or planned by the International Maritime Satellite Organization (INMARSAT) and other recognized satellite operators) and earth stations located in Australia, Canada and France. On board aircraft, a common avionics system will permit safety communications from the cockpit to air traffic control and airline ground operations, as well as passenger-related services and passenger telephony.—*SITA.*

Coast earth station for China

☐ A coast earth station for maritime satellite communication system of the International Maritime Satellite Organization (INMARSAT) is to be delivered to China by *EB Nera* (Norway).

The station will be installed in Beijing to handle communications from the mainland via satellite to ships in the Pacific and Indian Oceans.

The contract has been partly financed by Norwegian development aid funds.

Due to be working by early 1989, the Chinese station embraces two parabolic antennas (each 13 m in diameter), transmission and reception equipment and a microprocessor-based control system.

The delivery also includes a radio-link system to connect the INMARSAT facility to the international telecommunication network in Beijing.

The INMARSAT contract joins a series of Chinese assignments won by EB Nera over the past four years, which include radio link and satellite communication equipment worth more than 120 million krones in all.—*EB Corporation.*

EBU technical centre moving from Brussels to Geneva

☐ The Administrative Council of the European Broadcasting Union has decided to recommend that the Technical Centre, which has been located in Brussels since 1950, should be moved to Geneva. The decision was taken at a meeting in the Union's Geneva headquarters on 5 December 1987 and has still to be formally ratified at an Extraordinary Session of the General Assembly in the course of February 1988.

The decision follows discussions over a number of years with the Belgian Government concerning the major problem the EBU has been facing in Belgium of recruiting foreign (non-Belgian) staff. This is due to the high-level of personal taxation which prevails in the country. It has always been the Union's policy that its permanent services should employ a fair proportion of specialist staff from member organizations. The EBU does not benefit from the special fiscal conditions enjoyed by certain intergovernmental organizations in Belgium.

In deciding on the move to Geneva, the seat of the Union, the Council took into account an offer from the Government of Luxembourg that the Technical Centre should move there. However, it was felt the best solution was to centralize the permanent services in one place with a view to rationalization and better co-ordination.

A special task force is to be created to ensure the smooth transfer of staff and facilities from Brussels to Geneva with the first moves likely to take place in 1989. Particular emphasis will be placed on social and human questions arising from the relocation.—*EBU.*

ULCRA General Assembly

☐ The Director General of Mexican Radio, Television and Films, Jesús Hernández Torrez, was elected Chairman of the Executive Committee of the *Unión Latinoamericana y del Caribe de Radiodifusión* for the period 1987-1989.

The election, which met with the unanimous approval of the delegates of some 200 radio and television companies from 19 countries, took place during the second ULCRA General Assembly held in San José (Costa Rica) in November 1987.

The Secretary-General of ULCRA, Armando Vargas Araya, said that the Assembly had decided to go ahead with the "Latinvision" project to establish a daily exchange of television and radio news via satellite between the member broadcasters of ULCRA. At present, ULCRA produces a weekly review of Latin American television news, which is published in the Argentine and distributed in that country as well as in Uruguay, Peru, Venezuela and Cuba.

The General Assembly also decided to hold *ULCRA III*, an audiovisual fair for Latin American countries, in Mexico in May 1988, where audiovisual material produced in the region will be exchanged, bought and sold.

Profit share for staff

☐ British Telecom has set aside 15 million pounds sterling out of its half-year profits for its employee profit sharing scheme. The scheme will start operating in June this year when the full-year results are announced.—*British Telecom.*

Spain: agreement to set up a high-technology company

☐ *Amper*, one of the *Telefónica* group of companies, and *AT&T Philips* (APT) have signed an agreement, proposed by Telefónica, to set up a jointly owned company for the research, production and installation of high-technology communications equipment.

Apart from installations, the new company will produce transmission, optical fibre, intelligent network and advanced switching equipment, and will set up an integrated services digital network specialized centre to provide research and development facilities for all APT's international markets.

Telefónica, which sponsored the agreement, has evaluated its purchasing requirements in the light of the increasing demand for sophisticated, high-technology services, and the need for network modernization.

Apart from supplying Telefónica, the new company is planning sales to other national markets and intends to export 25% of its production to foreign markets.—*Telefónica.*

A study for the introduction of selected communications software

☐ BellSouth International has announced the signing of an agreement with *Società Italiana per l'Esercizio Telefonico pa* (SIP), a telephone operating company, to commission a study for the introduction of selected communications software.

Bell Communications Research (Bellcore), the research subsidiary of seven regional telephone operating companies of the Bell group in the United States, will also take part in the project.

The purpose of the project is to determine the feasibility, within the context of an "intelligent" network, of introducing selected Bellcore communications software and of planning a user-controlled telecommunication network for Italy.

The planned study is to assess the possibilities of using *Flexcom* and *Telegate* in networks. Flexcom allows the automatic remote loading of electronic transmission equipment, offering telephone subscribers the possibility of controlling and configuring their "private" networks without the need for any direct intervention by the telephone company. Telegate offers both *800* and alternate billing services, with a number of other services such as credit card checks, "customized" calls and the possibility of "private" virtual networks.—*Burson Marsteller/BellSouth International.*

IDC granted licence in Japan

☐ Japan's Ministry of Posts and Telecommunications has granted a category one licence for the operation of international telecommunication services for Japan to International Digital Communications Inc.

IDC is an Anglo-Japanese-United States consortium in which Cable and Wireless plc and *C.Itoh*, Japan's leading trading house, have the largest equity stakes. In addition, Cable and Wireless will be a minority co-owner of the Japanese part of the North Pacific cable.

The major shareholders in IDC are:

- C.Itoh (21.83%)
- Cable and Wireless (16.83%)
- Toyota (15%)
- Industrial Bank of Japan (2.50%)
- Daichi Kangyo Bank (2.50%)
- Fujitsu (2.50%)
- NEC (2.50%)
- Merrill Lynch (2.50%).

The Japanese end of the North Pacific cable will be jointly owned by IDC and Cable and Wireless. Cable and Wireless will be a minority co-owner holding 30%.—*Cable and Wireless.*

Thai railway contract

☐ The State Railways of Thailand (SRT) have awarded GEC Telecommunications Projects Division a turnkey contract worth almost 3 million pounds sterling for a train dispatching telephone system for the whole of their national railway network.

Many national railways are predominantly single track systems and a dedicated telephone network for dispatching trains from point to point is an important part of their operation. Over 3700 km of track will be covered by the new system which involves the design, supply, installation and commissioning of telephone equipment in 11 dispatcher control centres and over 600 wayside stations. Voice recording facilities, back-up power supplies, diesel generators and solar power equipment are included to ensure the security of the system.

The project is funded by the Overseas Economic Cooperation Fund of Japan.—*GEC.*

In brief ...

☐ *Infonet*, the international network service of Computer Sciences Corporation (CSC), has signed an agreement with *VTR Telecomunicaciones* for Infonet marketing and customer service support, and **international data communications services in Chile**. —*CSC.*

☐ *Nippon Telegraph and Telephone Corporation* (NTT) has announced that its **long-distance rates** for calls exceeding 320 km will be **reduced** by about 10% during fiscal year 1988.—*NTT.*

☐ Ferranti has announced that it has agreed to sell its semiconductor operation to the Plessey Company plc. Plessey has agreed to pay Ferranti 30 million pounds sterling in cash.—*Ferranti.*

☐ Teleglobe Canada Inc. has signed an agreement with the European Broadcasting Union (EBU) to provide viewers in Europe with television coverage of the **1988 Winter Olympic Games** in Calgary, under a contract worth at least 3.15 million Canadian dollars.

Images will be transmitted directly to Europe from a specially constructed and fully dedicated satellite earth station located at the International Broadcast Centre in Calgary. The station will be linked to an International Telecommunications Satellite Organization (INTELSAT) satellite at 307° E longitude over the Atlantic Ocean. The signals will then be directly transmitted to earth stations in the United Kingdom, the Federal Republic of Germany and France for redistribution to EBU member broadcasters. Eastern European broadcasters will also receive the Games as a result of an agreement between the EBU and the International Radio and Television Organization (OIRT).—*Teleglobe Canada.*

Personnel changes ...

... in the Central African Republic

☐ Mr Thomas Mapouka has been appointed Minister of Posts and Telecommunications.

... in Liberia

☐ Mr Morris M. Dukuly has been appointed Minister of Posts and Telecommunications.

... in Niger

☐ Batallion Chief Issa Amsa has been appointed Minister of Posts and Telecommunications.—*ITU Notification No. 1241.*

Technical News

"Fobos" spacecraft

☐ A spacecraft which will carry equipment from 12 countries will be launched by the USSR during the course of 1988. Named *Fobos*, the spacecraft will carry 25 experiments to carry out investigations of interplanetary space and make a study of the Sun and its surroundings.

The spacecraft will be launched into an Earth-Mars trajectory. On reaching Mars after some 200 days, it will be placed in orbit around the Martian satellite Phobos to investigate the latter's chemical and physical composition, spectral characteristics and seismology. A mobile package of equipment, capable of movement by means of 20-m jumps, will be placed on the surface of Phobos. The spacecraft will also take television photographs with a resolution of 0.6 m.

The planned orbit of the spacecraft around Phobos is perigee 20 m, apogee 50 m, period 8 h.

The Fobos spacecraft has two solar panels and will carry a laser altimeter, equipment to make molecular analyses and to study Martian radioactivity. Data will be transmitted back to Earth at rates of 4 and 32 kbit/s. Fobos will have a 40-Mbit memory.

In addition to the USSR, the countries participating in this project are: Austria, Bulgaria, Czechoslovakia, Federal Republic of Germany, Finland, France, German Democratic Republic, Hungary, Poland, Sweden and Switzerland.

Phobos moves in an orbit situated at a mean distance of 9350 km from the centre of Mars (6000 km from the surface). It is not massive enough to have contracted to a spherical shape its dimensions being $20 \times 23 \times 28$ km. Its very low surface gravity leads to an escape velocity of only 10 m/s. An unusual fact about Phobos is that it is the only known satellite whose period of revolution is less than the period of revolution of the planet.—*USSR stand at TELECOM 87.*

Plan to facilitate access to supercomputers for European researchers and students

☐ IBM Europe has announced a major plan to promote the development of intensive digital computing in Europe. The plan includes the creation of specialized centres, training support, as well as the development and exchange of appropriate teaching tools and software.

The project is to be implemented in conjunction with at least five major universities and research institutes, which will carry out joint studies with IBM in the field. They will also act as specialized centres for the development and exchange of teaching tools and software.

IBM will also be supporting over 25 other research institutes and schools by providing them with IBM vector units. These advanced processors will facilitate participation in teaching programmes aimed at creating a generation of scientists and technicians in Europe who are familiar with intensive digital computing techniques.

The whole project will require an investment on IBM's part of 40 million United States dollars over two years.

The first specialized centre will be the *Centre national universitaire sud de calcul* (CNUSC) in Montpellier, which is developing advanced techniques in the field of parallel processing and high-speed transmission network management in conjunction with *IBM France*. For the new project, IBM will install its parallel Fortran prototype (PFP) software, a high-powered multiprocessor programming tool, in the computer laboratory of the CNUSC.

The CNUSC, which is one of the main nodes on the EARN (European academic research network), will also be "twinned" with Cornell University, one of the five intensive computation centres of the National Science Foundation in the United States. This twinning will take the form of a link-up between the *IBM 3090* processors of the two centres over a high-speed transmission line, and will enable them to share their research.—*IBM.*

Next generation of switching. PTT involvement in television distribution

☐ Dittberner Associates, Inc. has just released a new 500-page report entitled *Next generation of switching—PTT involvement in TV distribution*. The study is *Update XX* of Project ESS, Dittberner Associates' multi-client series that examines new technology and its implications for telephone operating administrations and telecommunication manufacturers. Update XX covers the range of broadband issues from applications, through switching technology developments and field trials, to recommendations and forecasts for the next decade. Moreover, to ascertain the realistic timing of demand for broadband switching equipment, Update XX analyses organizational, political, regulatory and control-of-content limitations as these affect ten selected telephone operating administrations which together represent more than two thirds of the total installed base of telephones in the world.

The report combines technical and business views of the total environment within which countries must determine their ability to implement switched broadband services. It also details the various field and pilot programmes which show the direction of future switched broadband services world-wide.

Perhaps the most helpful management planning feature of Update XX is the discussion of the problems ten selected countries face in becoming deeply involved in the distribution of entertainment television programming to the home. The discussion points out strategies by which obstacles can be avoided.—*Dittberner Associates.*

SATELLITE LAUNCHINGS NOTIFIED DURING PERIOD 24 SEPTEMBER TO 22 OCTOBER 1987

Code name Spacecraft description	International number	Country Organization Site of launching	Date	Initial orbital data		Frequencies Transmitter power	Observations
				Perigee (km) Apogee (km)	Period (min) Inclination (degree)		
Cosmos-1887	1987-83-A	USSR	29 Sept.	224 406	90.5 62.8		Research into: the effects of spaceflight on monkeys and other living organisms, radiation safety and physics. Taking part in the studies are scientists from the European Space Agency, Czechoslovakia, France, German Democratic Republic, Hungary, Poland, Romania and the United States

Code name Spacecraft description	International number	Country Organization Site of launching	Date	Initial orbital data		Frequencies Transmitter power	Observations
				Perigee (km) Apogee (km)	Period (min) Inclination (degree)		
Cosmos-1888	1987-84-A	USSR	1 Oct.	35 980	1443 1.4		
Cosmos-1889	1987-85-A	USSR	9 Oct.	216 400	90.4 70		
Cosmos-1890	1987-86-A	USSR	10 Oct.	414 442	92.9 65		
Cosmos-1891	1987-87-A	USSR	14 Oct.	957 1030	104.9 83		
Cosmos-1892	1987-88-A	USSR	20 Oct.	647 678	97.8 82.5		
Cosmos-1893	1987-89-A	USSR	22 Oct.	179 374	89.7 67		

Sources: COSPAR, NASA, specialized press.

New Products

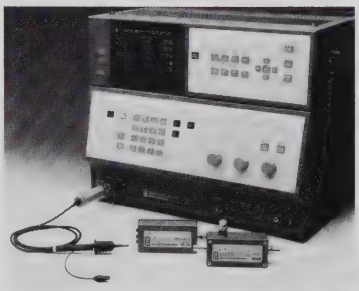
Graphic fault localization for telecommunication cables

☐ Leaks in pressurized cable networks are easily spotted with the help of the new *Lancier* data centre, including a comfortable graphics and calculation software package. It displays the pressure profile of cable sections, measured by pressure transducers and scanned by the Lancier automatic monitoring system *DW 1005/DW 1010*. Beside absolute pressure gradients also the difference between two selected momentary pressure profiles can be shown on the VDU screen. The location of leaks is calculated on request, indicating to the maintenance staff where to look for a leak in the cable sheath or closure.

Peter Lancier Maschinenbau-Hafenhütte GmbH & Co. KG, Postfach 47 01 60, D-4400 Münster-Wolbeck (Fed. Rep. of Germany). Tel.: (02506) 301-0. Telex: 892 553

FDM system analyser

☐ The new *TSA-2* from *Wandel & Goltermann* combines the functions of a selective level meter with those of a spectrum- and network analyser. The wide-frequency range of 100 Hz to 180 MHz allows measurement on VF channels, in the FDM baseband and in the IF band of FM radio-and satellite link systems.



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New FDM system analyser TSA-2

Operation is greatly simplified by the provision of stored FDM frequency plans to CCITT and INTELSAT standards. The correct bandwidth is set automatically when making measurements of pilot level, carrier leak, channel- or group power and weighted or unweighted noise. It is also possible to enter non-standard pilot frequencies or to set any offset frequency (e.g. signalling, test tones). Facilities are provided for rapid tone search, SSB demodulation (monitor loudspeaker built-in) and for measuring phase jitter to CCITT Recommendation O.91.

The results are displayed in numerical or graphical form on the screen together with all important test parameters. Spectrum analysis is useful for checking system occupation, while scalar network analysis allows measurements on 4-pole networks, the scale range being 100 dB. High accuracy and stability in all modes is guaranteed by synthesizer tuning and automatic calibration.

The TSA-2 can be remote-controlled, and is fully integrated into Wandel & Goltermann's *SMS-1* satellite test system for automatic line-up of INTELSAT FDM/FM systems.

Wandel & Goltermann, Postfach 45, D-7412 Eningen u.A. (Fed. Rep. of Germany). Tel.: (0 71 21) 86-15 70

Core alignment system for optical cable splicing

☐ A local core alignment system for splicing optical fibres was exhibited by *Ericsson* at TELECOM 87. Called *LCA850*, it allows low-attenuation joints to be quickly made in lower-cost cables.

The key to a low-attenuation splice is accurate alignment of the fibre cores in the cable segments to be joined. In cheaper fibres, however, this can be difficult as the core may be eccentrically placed within the cladding.

The LCA850 ensures a good splice by injecting light into one fibre segment, and detecting the relative position at which maximum light is transmitted to the other.

It is designed for use with *FSU850* field splicing unit (currently believed to hold around 30% of the world field splicing market) and can be used with either automatic or manual alignment techniques. It has an automatic bend relief function which releases the fibres as soon as the unit is switched off, thus reducing tension in the fibres.

Ericsson Fiber Optics AB, Box 42036, S-126 12 Stockholm (Sweden). Tel.: +46 8 726 3501

Optical-fibre terminals use surface mounting component technology

☐ Three new optical-fibre terminals have been introduced for 8, 34 and 565 Mbit/s transmission systems according to the CEPT hierarchy. They are all designed for use with single-mode fibres operating at a wavelength of 1300 nm. They provide fault location facilities and service telephone channels on the same fibre as the line signals.

The 8 Mbit/s system is designed for use mainly in urban networks with links of up to 20 km.

The 34 Mbit/s terminal is also for use mainly in urban networks, but with a laser transmit element and specially-designed PINFET receive element, repeater distances of up to 60 km are possible.

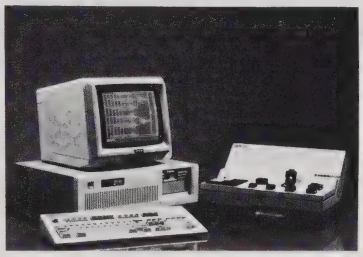
The 565 Mbit/s line system interfaces and multiplexes four 140 Mbit/s transmission lines. This is one of the *7000* series transmission products launched by *Ericsson* at TELECOM 87.

The 7000 series products use surface mount technology and VLSI components to minimize space, and CMOS components to minimize power consumption. They use a modular mechanical packaging, and microprocessor control for easier maintenance and network management.

Ericsson Telecom, S-126 25 Stockholm (Sweden). Tel.: +46 8 719 1931

Integrated test repair and quality management system

☐ To ensure high production yield, manual and automatic tests (in-circuit and functional tests) are carried out between the individual production stages (e.g. PCB production, assembly, soldering, testing). Faulty PC boards are repaired and tested again.



880045

The PLD test processor

To optimize these processes, *Rohde & Schwarz* is offering an integrated test, repair and quality management system, which consists of an in-circuit test station *TSI* or combinational test station *TSIC*, a programming station for TSI/TSIC, repair software and quality management software. This system is supported by a data base which collects the information on the various test and repair processes.

Rohde & Schwarz, Mühldorfstrasse 15, D-8000 München 80 (Fed. Rep. of Germany). Tel.: (0 89) 41 29 26 25

Small PABX

☐ *Pentaphone*, a PABX for 1 or 2 lines and 5 extensions which was on show at TELECOM 87, is intended for the small business user or for domestic use.

Existing wires and telephones can be used; the Pentaphone works with any 2-wire standard telephone. Its powerful microcomputer makes for a flexible system which can be programmed from any extension.

Extension user features include:

- internal calls to all extensions,
- exchange line calls,
- enquiry on internal and exchange line calls,
- call transfer with and without notice,
- general call to all extensions simultaneously,
- coded ringing,
- conference calls, etc.

System related features include:

- DTMF and LD telephones,
- exchange line barring,
- privacy on all calls,
- easy installation.

Different ringing signals indicate: internal calls, exchange line calls, general calls and coded calls. It is possible to enable or disable each individual extension for ringing on different types of calls.

Retail price of the system varies according to country but is normally less than 550 United States dollars.

Alcatel Nederland bv, Telecom Division, PO Box 40840, NL-2504 LV The Hague (Netherlands)

Remote control over the telephone network

☐ *Temex*, the name stands for telemetry exchange, is a system for the transmission of remote control information via the telephone network. Already existing telephone lines are used without causing any interference in normal telephone traffic which can be conducted simultaneously and independently. This is performed by the system from *SEL* through transmission above the speech band.

Temex allows the cost-effective transfer of remote control information within four main categories: remote measuring, remote control, remote selection and remote indication.

Every telephone local exchange is allocated to a Temex centre, which controls and supervises the information flow between the Temex network terminations and the remote control service centre. To this end, there are many processing units available within the multi-computer system. For the connection of the network termination, the Temex centre comprises transmission facilities.

The network termination connects the subscriber interfaces of the Temex system to private remote control facilities.

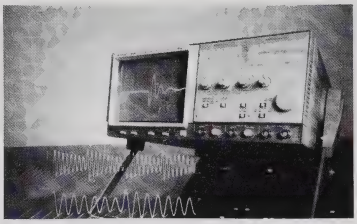
The *Deutsche Bundespost* will introduce Temex in 1988.

Standard Elektrik Lorenz AG, Lorenzstrasse 10, D-7000 Stuttgart 40 (Fed. Rep. of Germany). Tel.: + 49 7 11 8 21-23 27. Telex: +49 7 11 7 2 526 319

Digital storage oscilloscope

☐ Where conventional, analog oscilloscopes lose out on performance, the digital storage oscilloscope *BOS* from *Rohde & Schwarz* takes over. It can handle single shots or rarely occurring events (e.g. glitches), fast signals with a low repetition rate, pre-trigger events or very slow signals which just give a flickering, hard-to-view trace on an analog oscilloscope. Thanks to the built-in IEC/IEEE-bus interface, the variety of mathematical operations for signal processing and the extreme ease-of-operation, the BOS is ideal both for the laboratory and for use in fully automated, computer-controlled test systems.

The maximum sampling rate of 100 MHz and the 10 224-word memory make it possible to record a time interval longer than 102 µs; this, for example, is sufficient to record and analyse a complete video line. The input signals from both channels and stored signals can be added,



880043

The BOS digital storage oscilloscope

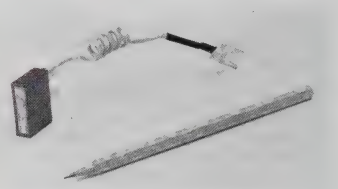
subtracted, multiplied, integrated, differentiated and squared to give complex waveforms. The recording, calculation and display are repeatedly performed.

Rohde & Schwarz, Mühldorfstrasse 15, D-8000 München 80 (Fed. Rep. of Germany). Tel.: (0 89) 41 29 26 25

New cell voltage equalizer

☐ A new cell voltage equalizer that prolongs the life of batteries and maintains their capacity was introduced by *Ericsson* at TELECOM 87.

Clipping onto the terminals of each cell, the voltage equalizer ensures that the cell gets only the precise float charge it needs, thus helping it attain the maximum possible working life.



880046

Cell voltage equalizer

The cell voltage equalizer is suitable for both sealed and vented cells. It uses a control circuit and a shunt regulator to increase or decrease the current through the cell. No load is added to the battery during discharge, and connection and operation are independent of the number of cells in the battery pack.

Each unit measures 30 × 23 × 9 mm and weighs 40 g.

Rifa AB, Ericsson Power Systems, S-163 81 Stockholm (Sweden). Tel.: +46 8 721 6980

Requests for Tenders

We should be obliged if administrations wishing to make use of this column would send us their tenders if possible three months before the closing date for bids.

ZAMBIA

Tender PTC 321 for procurement of mechanical aids financed by the African Development Bank (ADB) (loan No. CS/Z/TL/66/015), is issued by the Posts and Telecommunications Corporation.

Invitation to bid for the supply and delivery of the following: pneumatic compressors (2); paving breakers (8); tamping pads (2); moils (20); hoses (8); asphalt cutters (4); boulder breakers (2); jointing machines (6); cabling winches (2); water pumps (6); concrete mixers (2); thrust borers (2); compression pliers (10); chain pullers (6).

The accessories must be compatible with the pneumatic compressors and paving breakers.

Tender documents may be obtained from the: "Secretary, PTC Management Tender Committee, PO Box 71660, Ndola (Zambia)", on payment, by demand draft or cheque, of 250 Kwachas for bidders within Zambia or 25 pounds sterling/40 United States dollars for bidders outside Zambia.

Commercial and technical bids must be submitted in two copies to the: "Chairman, PTC Management Committee, PO Box 71660, Ndola (Zambia)" by 18 March 1988 at 14h00 (local time). Bidders wishing to attend may do so.

A telex offer may be submitted provided that it is confirmed by a valid formal tender which differs in no material respect from the telex offer. The telex numbers are ZA30500/30048.

Participation is open to all companies who belong to the participant states and/or member countries of the ADB.

TRANSLATION INTO CHINESE OF A SELECTION OF CCIR AND CCITT VOLUMES

A number of technical publications prepared by the International Radio Consultative Committee (CCIR) and the International Telegraph and Telephone Consultative Committee (CCITT) have been translated into Chinese and are now on sale.

This development has been made possible by the decision of the 1982 Plenipotentiary Conference in Nairobi (Resolution No. 65) when special funds were made available for this purpose. Similar arrangements were made for translations into Arabic and Russian.

This is the first time in the history of the ITU that such technical information has been published in Chinese. The work was undertaken in conjunction with the People's Posts and Telecommunications Publishing House which is associated with the Ministry of Posts and Telecommunications of China in Beijing.

The list of volumes now available in Chinese, as well as those which will appear in 1988 and in 1989, is set out on the following page.

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THE CCI VOLUMES PUBLISHED IN CHINESE

Volume/ fascicle No.	Title	Price (Swiss francs)
1. PRINTED AND PUBLISHED		
CCIR XVth Plenary Assembly (1982)		
☐ IV Part 1	Fixed-satellite service	37.–
☐ IV + IX Part 2	Frequency sharing and coordination between systems in the fixed-satellite service and radio-relay systems	14.–
☐ IX Part 1	Fixed service using radio-relay systems	26.–
☐ X Part 1	Broadcasting service (sound)	25.–
☐ X + XI Part 2	Broadcasting-satellite service (sound and television)	23.–
☐ XI Part 1	Broadcasting service (television)	29.–
☐ XIII	Vocabulary (CMV)	10.–
CCITT Yellow Book (1980)		
☐ III.1	General characteristics of international telephone connections and circuits. Recommendations G.101-G.171 (Study Groups XV, XVI, CMBD)	15.–
☐ VI.3	Specifications of Signalling System No. 6. Recommendations Q.251-Q.300 (Study Group XI)	11.–
☐ VI.6	Specifications of Signalling System No. 7. Recommendations Q.701-Q.741 (Study Group XI)	21.–
☐ VI.8	CCITT High Level Language (CHILL). Recommendation Z.200 (Study Group XI)	17.–
☐ VIII.1	Data communications over the telephone network. Series V Recommendations (Study Group XVII)	18.–
☐ IX	Protection against interference. Recommendations of the K Series (Study Group V). Protection of cable sheaths and poles. Recommendations of the L Series (Study Group VI)	10.–
☐ X.1	Terms and definitions	25.–
CCITT Red Book (1984)		
☐ II.3	International telephone service—Network management—Traffic engineering. Recommendations E.401-E.600 (Study Group II)	28.–
☐ III.2	International analogue carrier systems. Transmission media—Characteristics. Recommendations G.211-G.652 (Study Group XV, CMBD)	53.–
☐ III.3	Digital networks—Transmission systems and multiplexing equipments. Recommendations G.700-G.956 (Study Group XVIII)	38.–
☐ III.4	Line transmission of non-telephone signals. Transmission of sound programme and television signals. Series H, J Recommendations (Study Group XV)	20.–
☐ IV.4	Specifications of measuring equipment. Series O Recommendations (Study Group IV)	18.–
☐ VI.5	Digital transit exchanges in integrated digital networks and mixed analogue-digital networks. Digital local and combined exchanges. Recommendations Q.501-Q.517 (Study Group XI)	19.–
☐ VI.8	Specifications of Signalling System No. 7. Recommendations Q.721-Q.795 (Study Group XI)	40.–
☐ VI.13	Man-machine language (MML). Recommendations Z.301-Z.341	24.–
☐ VII.1	Telegraph transmission. Series R Recommendations (Study Group IX). Telegraph services. Terminal equipment. Series S Recommendations (Study Group IX)	34.–
☐ VII.2	Telegraph switching. Series U Recommendations (Study Group IX)	31.–
☐ VII.3	Terminal equipment and protocols for telematic services. Series T Recommendations (Study Group VIII)	66.–
☐ VIII.2	Data communication networks; services and facilities. Recommendations X.1-X.15 (Study Group VII)	9.–
2. TO BE PRINTED AND PUBLISHED IN 1988		
CCITT Red Book (1984)		
☐ I	Minutes and reports of the Plenary Assembly. Opinions and Resolutions. Recommendations on the organization and working procedures of the CCITT (Series A); means of expression (Series B); general telecommunication statistics (Series C). List of Study Groups and Questions under study	40.–
☐ III.5	Integrated Services Digital Network (ISDN). Series I Recommendations (Study Group XVIII)	22.–
☐ V	Telephone transmission quality. Series P Recommendations (Study Group XII)	43.–
☐ VI.10	Functional specification and description language (SDL). Recommendations Z.101-Z.104 (Study Group XI)	22.–
☐ VI.11	Functional specification and description language (SDL). Annexes to Recommendations Z.101-Z.104 (Study Group XI)	39.–
☐ VIII.3	Data communication networks; interfaces. Recommendations X.20-X.32 (Study Group VII)	46.–
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CCITT Red Book (1984)		
☐ X.1	Terms and definitions	69.–

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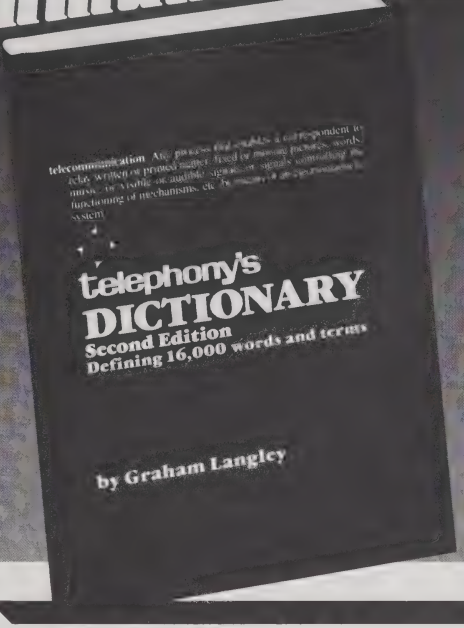

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So have new words. Our first **DICTIONARY** had 14,500 words and terms. This new one has 1,500 more — a total of 16,000 definitions. Author Graham Langley, well-respected telecom engineer and executive who has worked in many different parts of the world, began updating the **DICTIONARY** virtually as soon as the First Edition came off the press. Now, we are ready with the Second. And, not only does it contain more information, it also is improved in other ways. The most obvious is that it has a hard cover which makes it more attractive, more durable and easier to handle. Also, the type size has been increased which makes it easier to read.

But its biggest advantage is that it is up to date; it has all the new words, terms and acronyms that have come in with the increased use of fiber optics, with the increased digitalization of switching and transmission facilities, with a burgeoning cellular mobile telephone market, with a proliferation of satellite-based services. Not to mention the changes in the language of telecommunications brought about by divestiture and deregulation in the U.S. and similar actions going on under the name of liberalization in the rest of the world. It's all here in this new **DICTIONARY** from **TELEPHONY.**

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Books

by A. El-Zanati

INTRODUCTION TO COMPUTER-AIDED PLANNING OF TELEPHONE NETWORKS[1]

by E. Szybicki.

Contents include: introduction; network structure; traffic variations; planning criteria; planning procedures; forecasting methods; traffic distribution; techno-economical evaluations; optimum location of exchanges; planning of distribution cable plant; dimensioning of fixed-hierarchical trunk networks; traffic measurements; planning requirements; numbering; computerized planning tools; numerical methods in the use of computers for telephone network planning; new routing techniques and network management; etc.

[1] *One paperback volume; pp. 130; illustrations, tables, diagrams. 21 × 28 cm. Published by* IST Systems, *Chemin David-Munier 22A, CH-1223 Cologny/Genève (Switzerland), 1986.*

ADAPTIVE TRAFFIC ROUTING AND NETWORK MANAGEMENT IN MODERN TELEPHONE NETWORKS[2]

by E. Szybicki.

The contents of this volume which has been developed as an aid to training courses include: evolution of telephone networks; evolution of traffic routing in telephone networks; network performance indicators; present network configurations; fixed-hierarchical traffic routing; control of call set-up in fixed-hierarchical networks; grade-of-service criteria for fixed-hierarchical networks; performance of fixed-hierarchical networks; present network management techniques; requirements for management of network resources; traffic routing and network management; adaptive traffic routing system description; network management functions; on-demand network management; system realization; etc.

[2] *One paperback volume; pp. 89; illustrations, tables, diagrams. 21 × 28 cm. Published by* IST Systems, *Chemin David-Munier 22A, CH-1223 Cologny/Genève (Switzerland), 1985.*

EURODATA FOUNDATION YEARBOOK 1987-88[3]

Data and text communications services in Europe, April 87-March 88

The Eurodata Foundation undertakes a wide range of market research and publications activities for 18 European telecommunications administrations (Austria, Belgium, Denmark, Finland, France, Federal Republic of Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom).

The Foundation's work covers the vital aspects of investment, strategic and service planning in the rapidly developing world of non-voice communications. The research and data base activities are designed to meet members' needs, assisting each country to see almost a decade ahead in its planning for growth and change.

Eurodata Foundation publications, using information supplied directly by its members, gives the international telecommunications consumer access to the latest details of services and their projected development. The publications are an authoritative source of information for investment decision-makers in all user environments from the small business to the large multinational.

Published each year in April, the Yearbook gives comprehensive information of the data and text communications services offered by Eurodata Foundation's 18 members. The Yearbook is designed to help managers working in network and service planning, telecommunication consultancy and management.

[3] *One bound volume; illustrations, tables, maps, diagrams. 21 ×28 cm. Published by* Eurodata Foundation, *54 Fetter Lane, London EC4A 1AA (United Kingdom), 1987. Price: 130 pounds sterling (Yearbook and revision of tariffs); 105 pounds (Yearbook only).*

EURODATA FOUNDATION VOICEBOOK 1987-88[4]

Voice communications services in Europe, April 87-March 88

The Voicebook contains information on voice communication services and equipment provided by Eurodata Foundation member organizations together with technical data and tariffs. Additional information on structure and policy, permission to attach equipment, regulations and procedures, and contact points for service and information is also provided. Additional information is provided on certain Japanese and North American voice communication tariffs.

Member organizations have supplied a wide range of information which will be of use and interest to users, consultants, equipment suppliers and other parties involved in the current European voice communications arena. The Voicebook has been compiled as a readily accessible, authoritative, comprehensive and up-to-date information source to assist organizations in the planning, implementation and use of the facilities offered. The information in the book is not intended to represent any contractual commitment on the part of Eurodata's members and consequently users are advised to approach the organizations directly to finalize details before enter-

ing into contractual service arrangements.

Contents include: general information; network and exchange-based services; mobile services; equipment and maintenance; network information; tariffs; literature and contact points; etc.

[4] *One bound volume; illustrations, tables, maps, diagrams. 21 ×28 cm. Published by* Eurodata Foundation, *54 Fetter Lane, London EC4A 1AA (United Kingdom), 1987. Price: 125 pounds sterling (Voicebook and revision of tariffs); 105 pounds (Voicebook only).*

BEING THE BOSS: THE CRAFT OF MANAGING PEOPLE[5]

by L. Kent Lineback.

This is a clear, concise, action-oriented guide to what managers really do–the basic activities required to manage people effectively. It is not a book of abstract management theories; it is a practical manual which managers can refer to again and again in their daily work.

The book's three parts present a comprehensive game plan which will aid the manager in co-ordinating his day-to-day activities. Part I uses a brief case history to define what a manager of people does and why his job is so difficult. It then goes on to present a simple, yet effective strategy managers can use every day. Part II presents and explains the fundamental cycle of management, a set of specific activities which the manager repeats constantly. Everything a manager does can be built around this cycle. Part III deals with problem solving. Each of the 23 short chapters in this part deals with a specific problem often faced by managers–problems such as disciplining, hiring, firing, and appraising. Each chapter presents useful ideas and guidelines for action.

Although this book is written primarily to aid first-level managers, it is also an invaluable aid for experienced and senior managers. In addition to helping the new manager learn how to manage people, it will remind the experienced manager what is required to manage effectively, and will aid the senior manager in developing the skills of subordinate managers.

[5] *One bound volume; pp. xi + 177; illustrations, diagrams. 16× 24 cm. Published by* IEEE Press, *345 East 47th Street, New York, NY 10017-2394 (United States), 1987.*

THE X.25 HANDBOOK[6]

by B. Lindgren.

The Handbook has developed out the need for a quick reference to the International Telegraph and Telephone Consultative Committee (CCITT) Recommendations–where none of the important details are lost. The Handbook is currently being used as the basis of the X.25 training programme at the Training Centre of the Swedish Telecommunications Administration and has been officially approved by the Administrations as a tool for all personnel working with X.25.

Contents include: X.25: link layer protocol, LAPB; diagram of states, time-outs; cause and diagnostic codes; packet formats, modulo 8 and 128; X.25 facilities, formats and codes. X.75: link layer protocol; time-outs; cause and diagnostic codes; packet formats, modulo 8 and 128; network utilities, formats and codes. X.3, X.28 and X.29: X.3 parameters; X.28 commands and responses; X.29 formats and codes; X.29 error codes. X.121: list of DNICs and packet switched networks; list of data country codes; etc.

[6] *One bound volume; illustrations, tables, diagrams. 15 × 21 cm. Published by* Infotrans AB, *Klängrosgränd 4, S-393 65 Kalmar (Sweden), 1987.*

THE COMMUNICATIONS USERS' YEAR BOOK 1987[7]

edited by A. Simpson.

Contents include: the network services jungle; DP and telecoms; communications in the competitive environment; OSI standards gathering pace; introducing X.400; BT tariffs; Mercury tariffs; cellular radio tariffs (Cellnet, Vodafone); diary dates. Also included are buyers' guides on telephone; mobile communications; computer communications; networking equipment and network services; national carrier services; text and graphics; design and manufacture; cable and satellite; test, ancillary equipment and power supplies; support services; installation and maintenance; directory of manufacturers and suppliers; etc.

[7] *One paperback volume; pp. 511; illustrations, tables, diagrams. 21 × 28 cm. Published on behalf of the* NCC, The National Centre for Information Technology, *by* The Manor House Press Ltd, *404-406 Holloway Road, London N7 6QA (United Kingdom), 1987.*

NUMERISCHE BERECHNUNG ELEKTROMAGNETISCHER FELDER: GRUNDLAGEN, METHODEN, ANWENDUNGEN[8]

(Numerical calculation of electromagnetic fields: basic principles, methods, applications), by C. Hafner.

This book sets out the main mathematical, physical and numerical principles involved (differential and integral forms, Maxwell's theory, solution methods), classifies and discusses the most common technical problems and describes the main path to the calculation of electromagnetic fields. The processes most widely used today (finite elements, finite differences, moment methods, partial surface techniques, point matching, equivalent charge methods, spectral domain analysis, general theory of diffraction, ray optics,

singularity expansion method, mode matching technique) are outlined and compared so as to bring out their affinities as well as their differences, thus making it easier for the reader to come to grips with the technical literature on the subject.

The multiple multipole (MMP) method developed by the author is described in detail, with numerous examples, in order to illustrate the process followed in developing and applying modern numerical field computation programmes, together with their possibilities and limitations.

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[8] *One paperback volume; pp. viii + 230; illustrations, diagrams. 16 × 24 cm. Published by* Springer-Verlag, *Heidelberger Platz 3, D-1000 Berlin 33 (Fed. Rep. of Germany), 1987. Price: 68 deutsche Marks.*

Review of Reviews

A list of articles in other technical publications which may be of interest to readers of the Journal. The articles are listed under the language of the publication.

FRENCH

Air & Cosmos. 6, rue Anatole-de-la-Forge, F-75017 Paris. Année 1987. **N° 1164.** P. 52. *Langereux P.* Arianespace prévoit un marché de satellites militaires en Europe – P. 54. La Nasa prévoit de lancer 19 fusées et 19 navettes d'ici fin 1990 – P. 56. Feu vert pour le développement d'Ariane 5, Hermès et Columbus.

Communications. Editions SARL, BP 238, 1000 Tunis RP. Année 1987. **N° 19.** P. 16-18. *Richter W.* L'impact des télécommunications sur la croissance économique des pays en voie de développement – P. 19-23. Télécommunications: le grand chambardement...

Electronique. AT Zeitschriftenverlag électronique, Bahnhofstrasse 39-43, CH-5001 Aarau. Année 1987. **N° 11.** P. 36-37. *Nicola J.-M.* Le petit géant suisse – P. 42. Analyse rapide des surfaces de semiconducteurs.

Electronique pratique. 2 à 12, rue de Bellevue, F-75940 Paris Cedex 19. Année 1987. **N° 109.** P. 66-77. *Gasser P.* Télécommande téléphonique – P. 115-116. Connaître et comprendre les circuits intégrés.

Etudes de radio-télévision. Bureau d'études de la RTBF, Local 10 M 2, Boulevard Reyers 52, B-1040 Bruxelles. Année 1987. **N° 37.** P. 95-105. *Remy M.* L'école et l'image électronique: vers un regard multimedia.

Megahertz. Revue européenne d'ondes courtes, Editions SORACOM, La Haie de Pan, F-35170 Bruz. Année 1987. **N° 57.** P. 51-53. *Cheynard J.-L.* Trajsat – P. 66-69. Coordcom: un système de communication au service des secouristes suédois.

Minis et Micros informatique électronique. 5, place du Colonel-Fabien, F-75491 Paris Cedex 10. Année 1987. **N° 290.** P. 53-57. Les réseaux logiques programmables et leurs applications – P. 59-62. *Delaporte L.* BUS VME et MS-DOS pour l'industrie.

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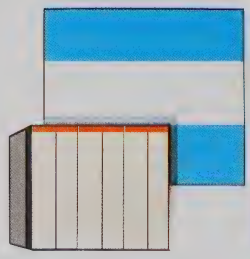
SIEMENS

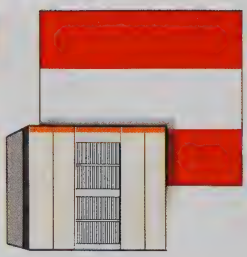
EWSD shows its colours

On the following two pages you will find all the countries that have opted for EWSD so far.
For further information please write to:
Siemens AG,
Infoservice 141/063 JU,
Postfach 2348, D-8510 Fürth 2,
Federal Republic of Germany.

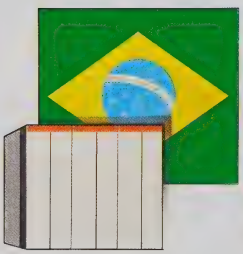
EWSD is the fully digital switching system from Siemens. Its outstanding feature is the state-of-the-art technology preengineered for ISDN. This telecommunications network for the future integrates all communication services in one network. By chosing the correct switching system, i.e. a switching system that is fully prepared for ISDN, telecommunications administrations all over the world decide today how efficient and future-proof their entire communications infrastructure shall be. This is therefore one of the most important decisions since the setting up of the subscriber dialed telephone service. Only the very best switching systems will be able to cope with this task. Post, telephone and telegraph administrations in the following countries have decided in favor of EWSD. A good many of them already take advantage of its perfect suitability for ISDN, implementing the integration of services with EWSD.



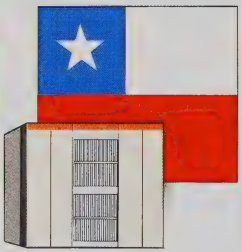
The first EWSD international transit exchange in Argentina went into service in Cordoba in 1984.



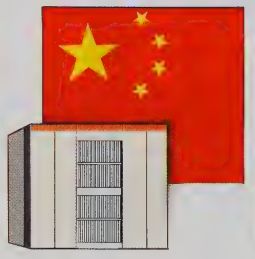
In the Austrian telephone network, the first EWSD local/transit exchange serving 10,000 subscriber lines was put into operation in Vienna in 1985. To date, Austria has placed firm orders for switching equipment for more than 300,000 lines.



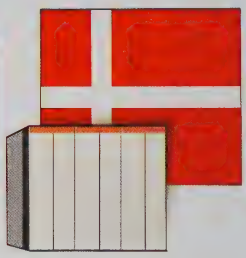
To date Brazil has placed orders with Siemens for EWSD digital switching equipment sufficient to handle over 390,000 line units.



EWSD demonstrates its advantages in conjunction with digital line units (concentrators) in an exchange in Valdivia.

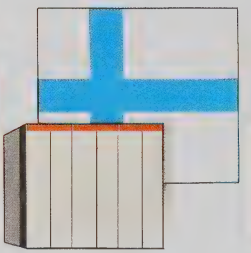


Following the order for 100,000 line units, EWSD will be at the heart of telecommunications networks in several chinese provinces.



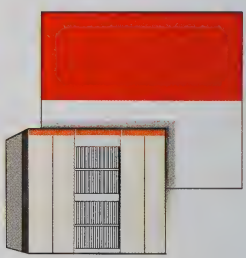
Denmark is planning to go over to ISDN operation in 1989, and Siemens is supplying the necessary digital switching equipment to the two largest telecommunications agencies in the country.

ISDN based on EWSD technology has been in full trial operation since the beginning of 1987 in a pilot project run by the Deutsche Bundespost. Nationwide introduction of ISDN is due to begin in 1988.



EWSD has performed well since 1982 even under the extreme conditions in the north of Finland.

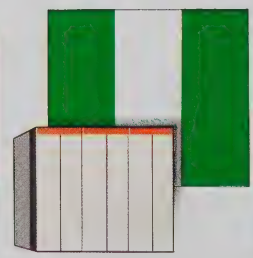
Three EWSD exchanges will soon go into service in Athens.



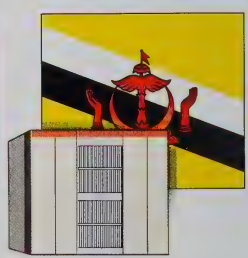
To date 32 EWSD exchanges have been set up in Indonesia. And the further expansion of the communications network in the form of EWSD exchanges, OMCs (operation and maintenance centers), and installation equipment has already been agreed.

The first EWSD local exchange with 14,000 subscriber lines went into service in Iran in early 1986.

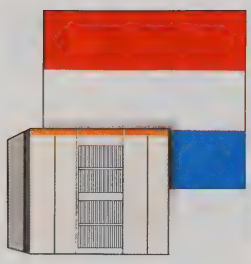
There are two EWSD exchanges in Tripoli and Zuara with 10,000 subscribers currently connected.



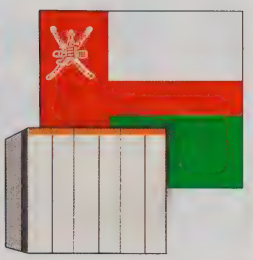
Siemens is supplying and installing EWSD local exchanges and container exchanges for the Nigerian PTT's Abuja telecom project.



After winning an international tender for the modernization and expansion of the telephone network in Brunei, Siemens has received an initial order to supply 11 EWSD local exchanges.

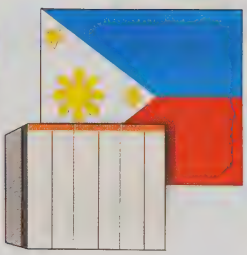


Luxemburg has decided in favour of the EWSD system equipped with the convenient operation and maintenance center.



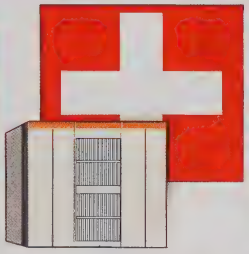
One of the most modern telecommunications networks in the world – using EWSD technology – was supplied as a turnkey project to the Sultanate of Oman.

Asuncion, the capital of Paraguay, is to get digital telecommunications – EWSD local exchanges and one local/transit exchange.



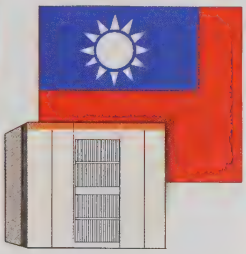
The PLDT, the largest telephone operating company in the Philippines, awarded us the contract to digitize the network with EWSD in 1980. Several trunk, local/trunk and international transit exchanges have gone into service since.

At the end of 1986 Portugal decided in favor of EWSD technology and awarded a contract for the supply of locally manufactured digital telephone equipment for more than 250,000 line units.

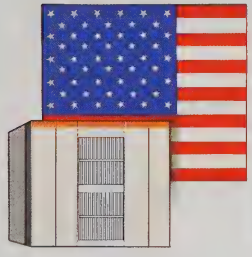


The first intercontinental EWSD digital exchange in Europe went into service in Switzerland in 1984, and in 1987 one of the first ISDN exchanges in Europe – EWSD from Siemens – was put into operation.

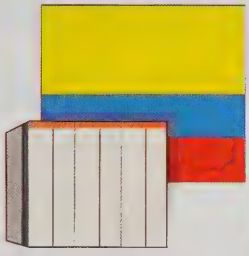
The first EWSD in the world is in Sunninghill Park, RSA. Since 1981 quite a range of EWSD exchanges – local, local/tandem, tandem, trunk, and digital line units (concentrators) – is in service.



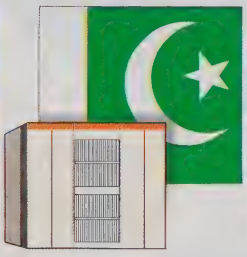
EWSD is also supplied ready for use in containers – an extremely economical solution in certain cases, as supplied for Taiwan with more than 100,000 line units so far.



EWSD is heading for great success in the USA:
Nine of the Bell Operating Companies have placed orders with Siemens for digital telephone equipment, among them the first EWSD/ISDN orders in the USA.

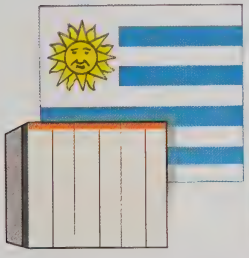


To date Columbia has placed orders with Siemens for the direct supply of digital switching equipment sufficient for more than 310,000 line units.
A maintenane center and a training center are also being set up.



So far the Pakistan PTT has placed orders for digital switching equipment for more than 580,000 subscriber lines. Also supplied will be facilities for local manufacture.

Under a contract from the Egyptian PTT, Siemens has supplied and installed a local exchange with 46,000 line units in the center of Cairo.



Uruguay's first EWSD exchanges was put into service by the national PTT in 1987, as part of a program to modernize the telecommunications infrastructure of a tourist region east of Montevideo.

Following an international call for tenders, Siemens has received large scale orders for the supply of EWSD to Venezuela. Also planned are the establishment of local manufacturing facilities, a training exchange and an OMC.

The Belgian government awarded Siemens a contract to supply digital switching systems to the postal administration Régie des Téléphones et Télégraphes during the coming five years.

The Turkish postal administration has ordered EWSD exchanges from Siemens for the first time. The contract encompasses the initial supply of nine local exchanges having 100,000 lines.

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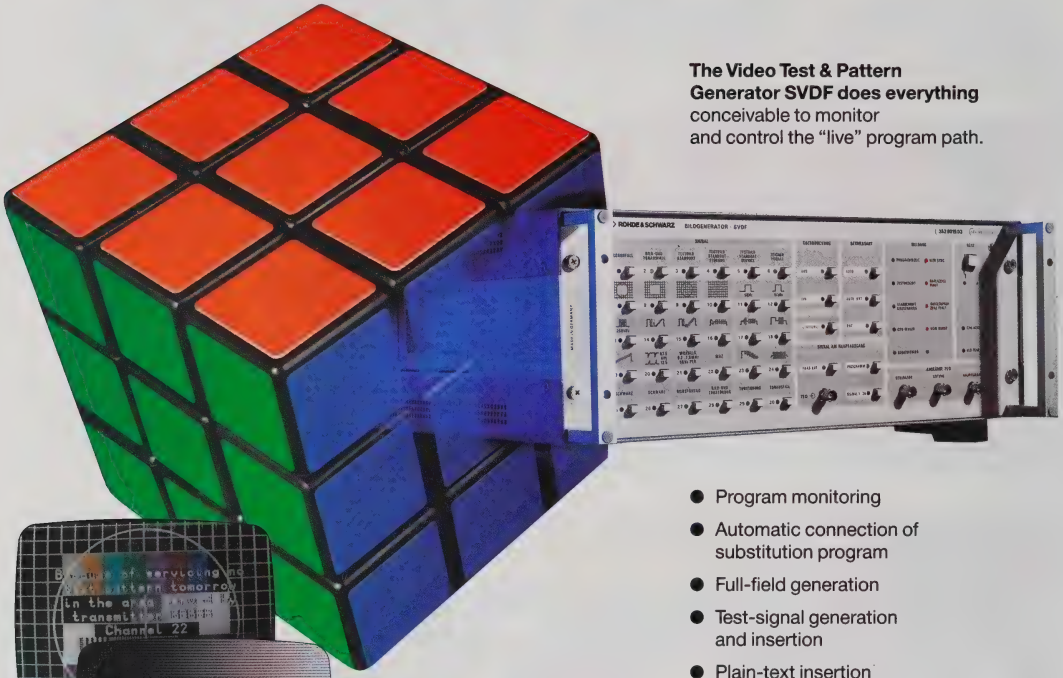
Video Test & Pattern Generator SVDF simply ingenious



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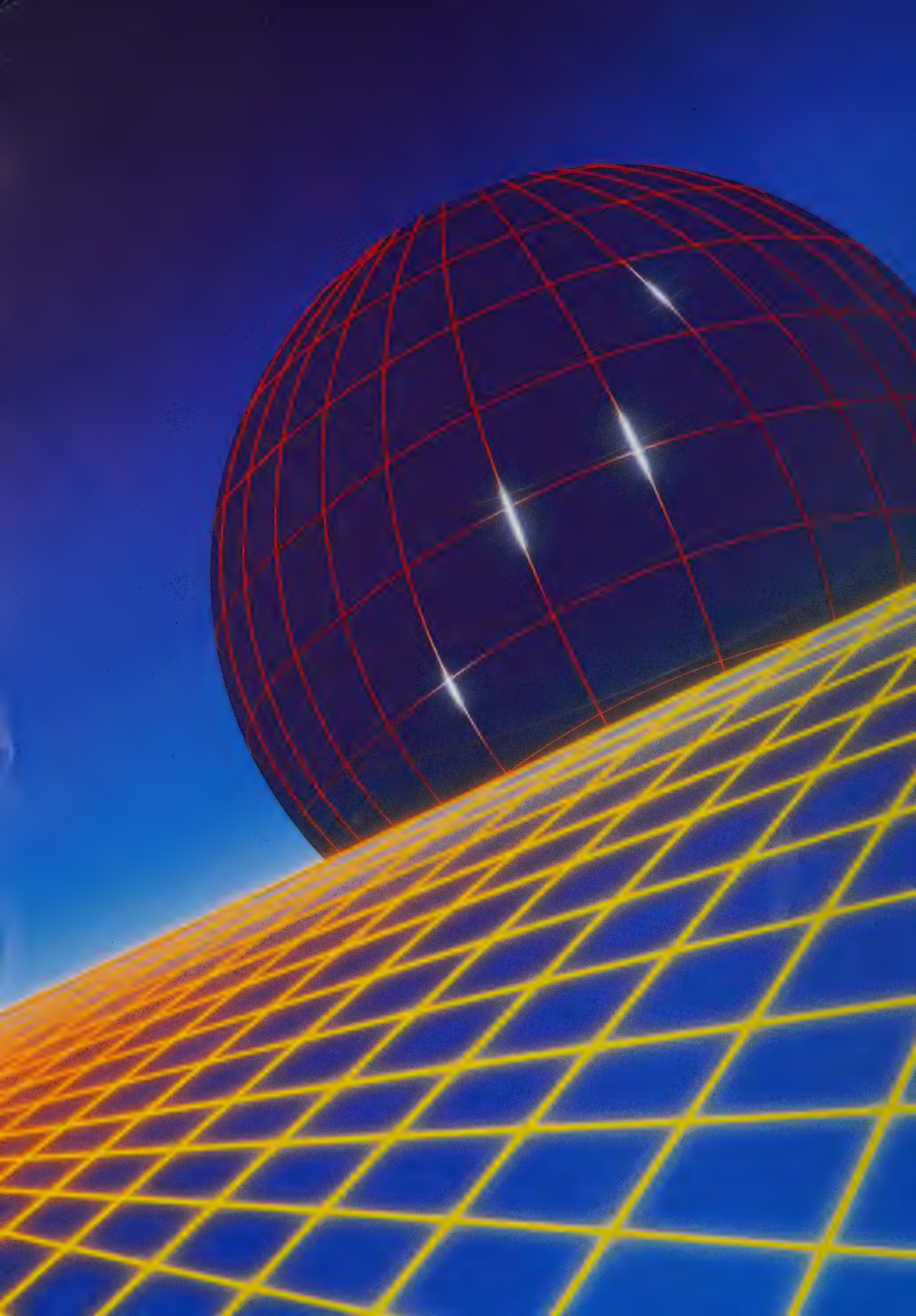

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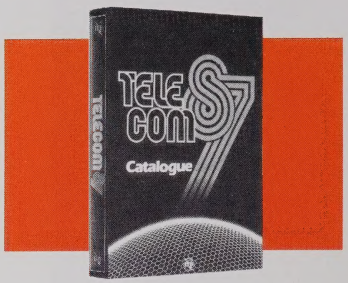

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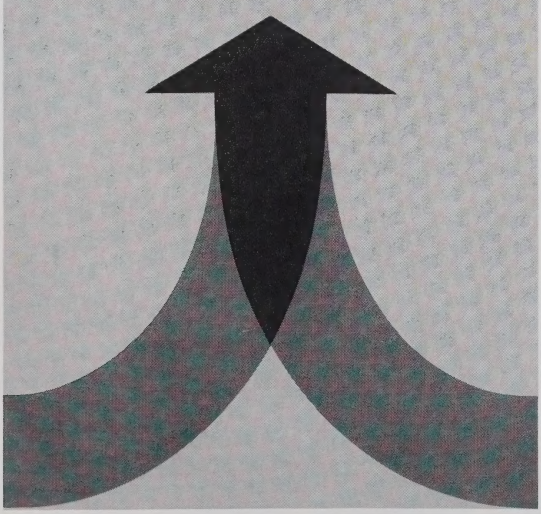

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